

CANADIAN MACHINERY

AND MANUFACTURING NEWS

Vol. XXV., No. 19

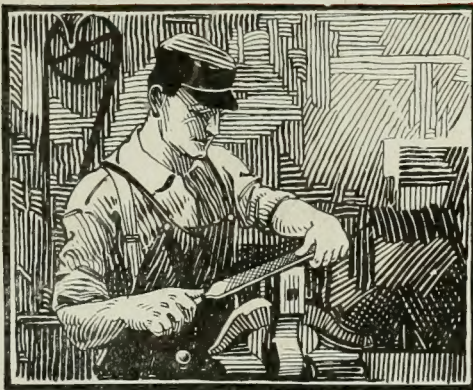
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May 12, 1921

\$4.00 a Year
Subscription Price

READ AND PASS TO	Check	See Page	READ AND PASS TO	Check	See Page

New Files for Old!



LET this be the rule in your shop. Tell your workmen to discard files when they cease to cut keenly.

Only then will you get the full value from your workmen's time and effort. Dull files mean poor work and wasted effort.

The following brands have been the standard for over fifty years and give maximum service before getting dull:

KEARNEY & FOOT - AMERICAN
GREAT WESTERN - ARCADE - GLOBE

FILES AND RASPS

Made in Canada by:

Nicholson File Company

PORT HOPE - ONTARIO

You can't help noticing the good qualities of Pratt & Whitney Taps

Their free cutting qualities, their extreme accuracy and their extraordinary ability to outlive others distinguish them.

The con-eccentric relief—a distinctive P & W feature—is the secret of their goodness. One-third of the cutting edge is concentric. The remaining two-thirds has eccentric relief. Taps can be sharpened at the only correct point—on the face of the cutting edge. Sharpening in no way affects their size.

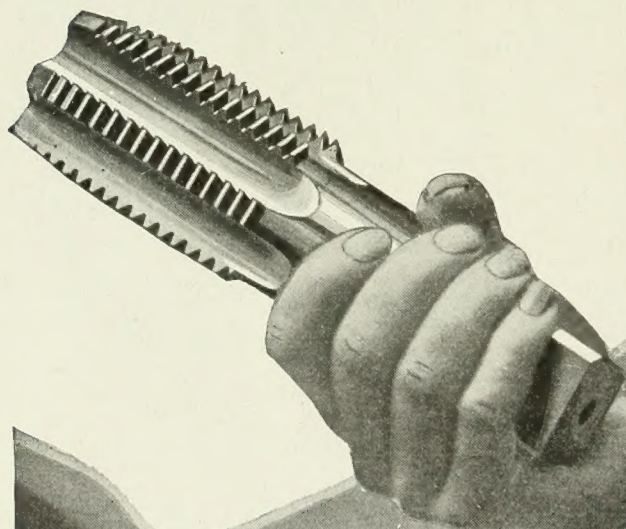
Yes, they cost a little more than some others, but they're well worth the difference. Carried in stock as are all other P & W Small Tools at our sales offices and agencies as listed.

PRATT & WHITNEY COMPANY OF CANADA, LIMITED

Works: DUNDAS, Ontario

MONTREAL	TORONTO	WINDSOR	WINNIPEG	HALIFAX
723 Drummond Bldg.	1002 C.P.R. Bldg.	Davis Building	1205 McArthur Bldg.	Roy Building
VANCOUVER, B.C. Equipment Co.				

"Some Tap"



PRATT & WHITNEY

The **BERTRAM** Machine **TOOLS** Page



18-inch Crank Slotting Machine

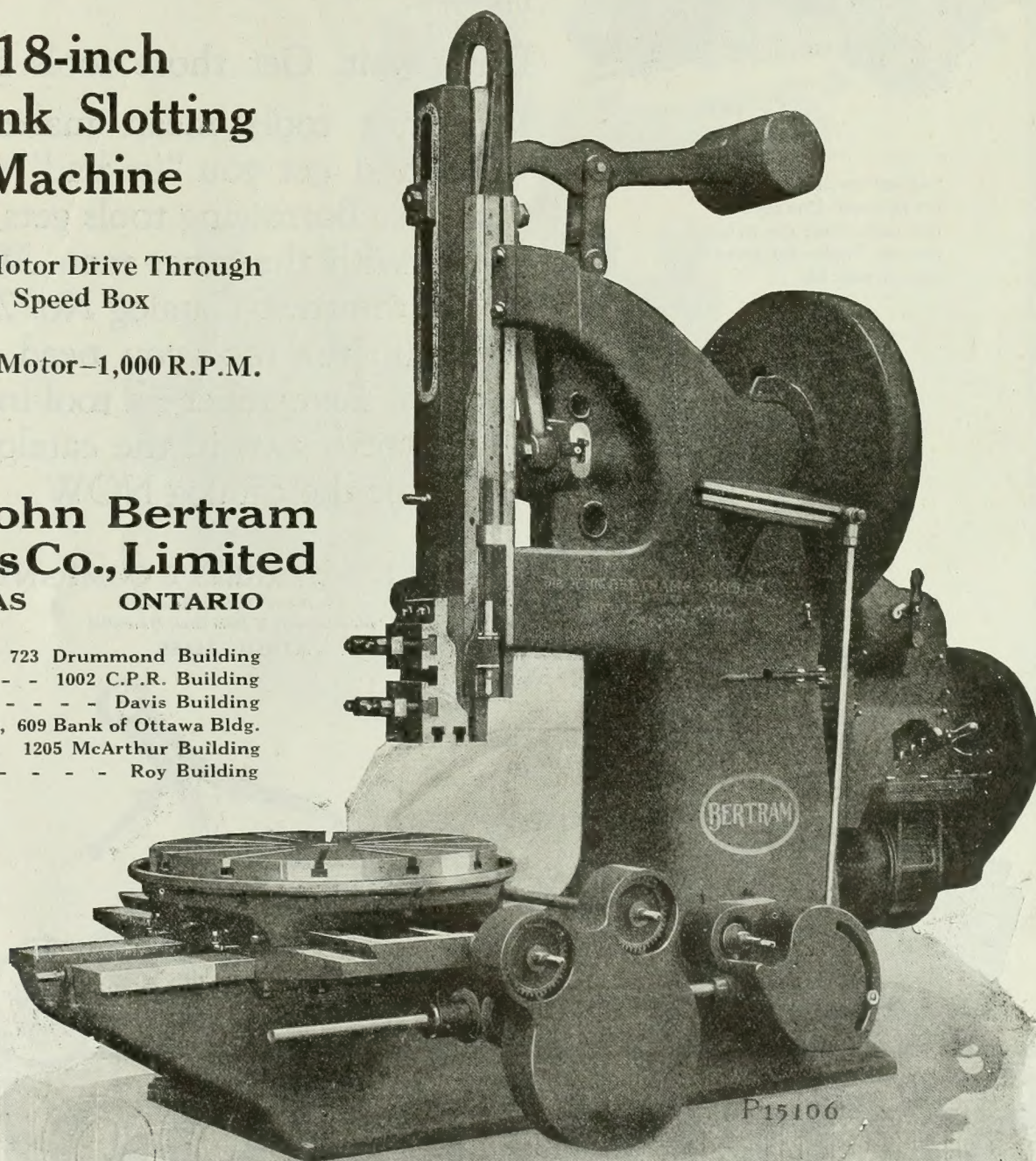
A. C. Motor Drive Through
Speed Box

10 H.P. Motor—1,000 R.P.M.

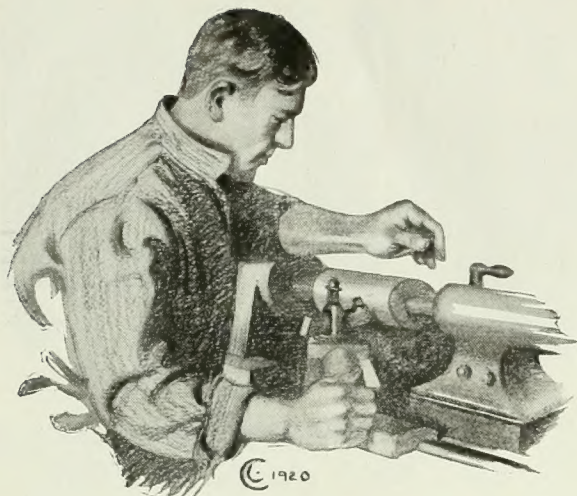
**The John Bertram
& Sons Co., Limited**

DUNDAS ONTARIO

Montreal, 723 Drummond Building
Toronto, - - 1002 C.P.R. Building
Windsor, - - - Davis Building
Vancouver, 609 Bank of Ottawa Bldg.
Winnipeg, 1205 McArthur Building
Halifax, - - - Roy Building



A Tool in the Kit is Worth Two in the Catalog



"All set" for work—except the right tool. Don't be like this man. Have the right Starrett Tools—for every job—in your kit.

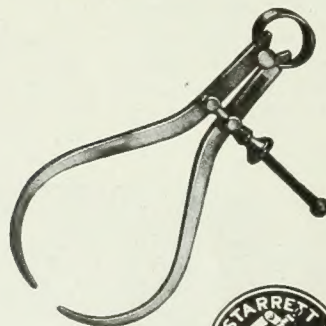
There are probably a number of Starrett Tools that you have been planning to buy for some time. You "just haven't gotten around to it yet".

Don't wait. Get those tools now. Makeshift tools mean makeshift work, and get you "in bad" with the boss. Borrowing tools gets you in bad with the other men. Write for the Starrett Catalog No. 22 "3" check up the tools you need, and buy 'em. Remember—a tool in the kit is worth two in the catalog. Write for the catalog NOW.

THE L. S. STARRETT COMPANY

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
ATHOL, MASS.

Get this Catalog
—NOW

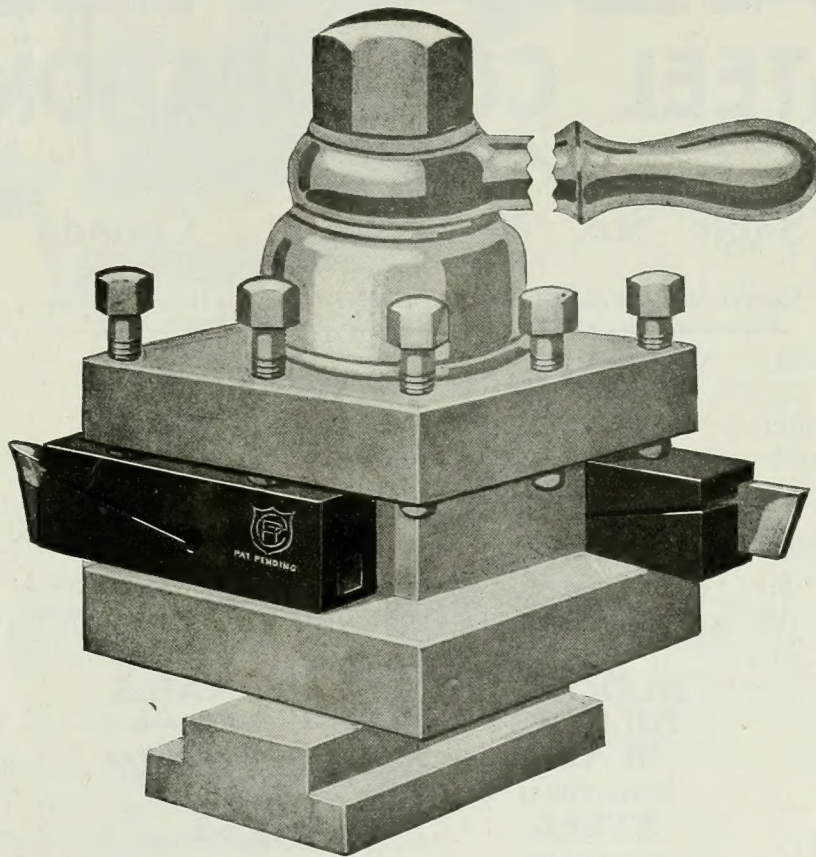


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Canadian Production Tool Company

LIMITED

WALKERVILLE, ONTARIO, CANADA



Manufacturers of High Grade
Tool Holders

*Write for
Catalogue*

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LIMITED

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Sales Offices:

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Alloy Steels

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All of these Steels we supply in HOT ROLLED BARS.
We also furnish in BLOOM, BILLET and SLAB
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SLABS**

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Open Hearth Quality

(All sections from 12 lbs.)
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**SPLICE
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**STEEL
TIE PLATES**

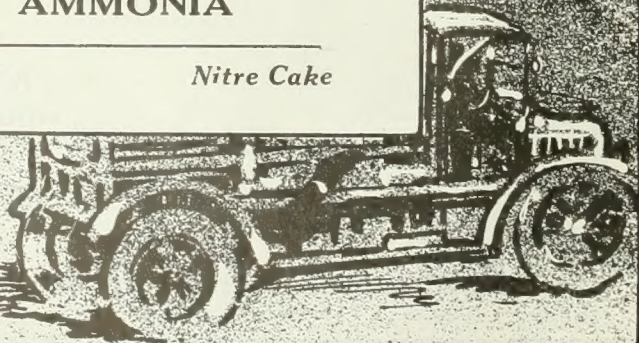
PIG IRON

**BASIC, FOUNDRY
MALLEABLE**

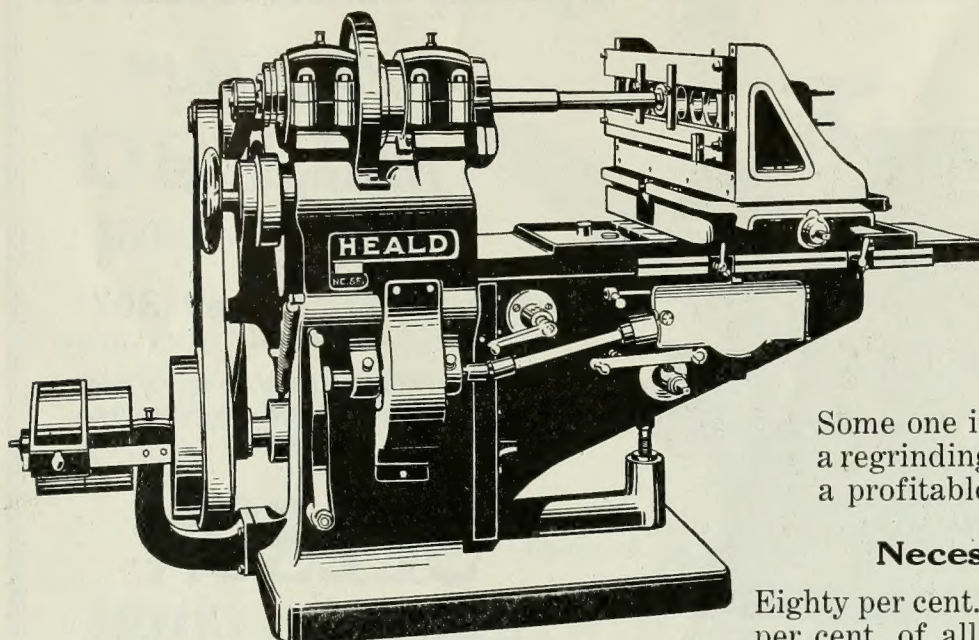
**SULPHATE OF
AMMONIA**

Sulphuric Acid

Nitre Cake



New Business Possibilities



A real regrinding machine. See how easily it handles a six cylinder en bloc.

Regrinding Cylinders

Makes Used Motors Better Than New

Some one in your vicinity is going to buy a regrinding machine and get the cream of a profitable business. Are you the one?

Necessary Equipment

Eighty per cent. of all pleasure cars and ninety per cent. of all commercial motors manufactured are ground. Heald Style No. 55 is built expressly for re-grinding work. It is simple, moderately priced, self-contained, and has a very large capacity and range, easily taking care of singles, doubles, four and six en bloc cylinders.

In addition, to handle the work satisfactorily, one should have a small lathe and drill press, bench and hand tools. A small external grinder would be convenient for finishing pistons, thus enabling the shop to purchase semi-finished pistons and grind them to over-size required.

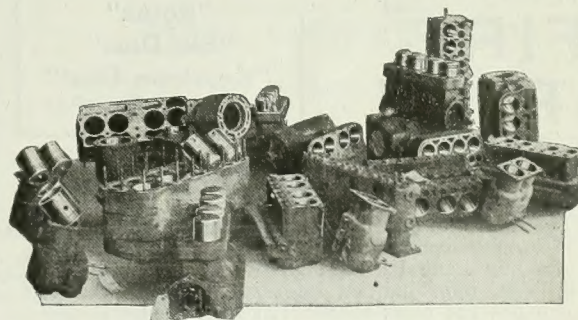
Opportune Time

There is no business to-day that has the possibilities and which fits as nicely into a small machine shop, automobile repair shop, or a concern doing welding, as the regrinding of worn or scored cylinders.

Advantages to the Automobile Owner

Reground cylinders fitted with new pistons and rings will give the motor much, if not more, power and pep than when it was new. It cuts the oil and gas consumption in two and stops all excessive smoking.

Whether you are already interested in automobile repairing or are seeking some profitable business to go into, be sure to consider the regrinding of motor cylinders.



One machine handles all sizes and shapes of cylinders

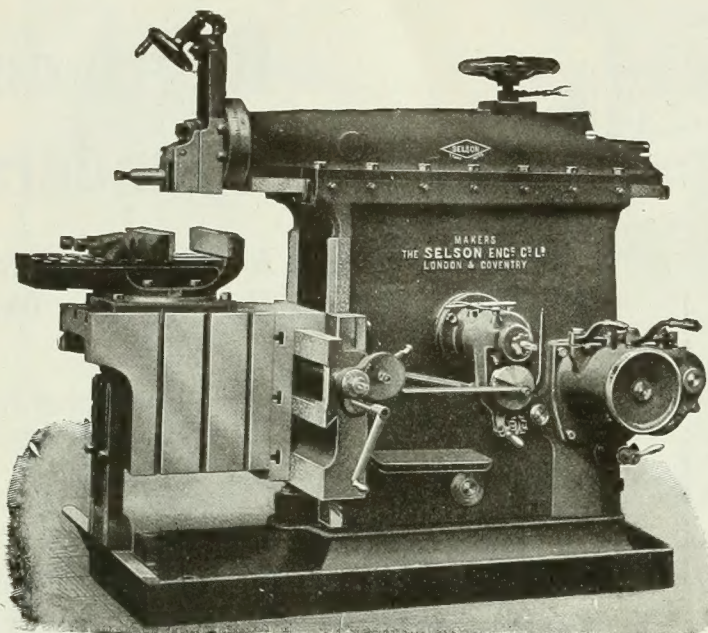
Now is the time to get started. We would like to talk with you personally or mail you further information.

H. W. PETRIE LIMITED

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The "SELSON" Shaping Machines



*High Speed
and
Heavy Cut*

Sizes
10, 13, 17, 25 and 30"

We have not space to give the many merits of Selson Shapers. Won't you write us?

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BRICK

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"Elkco" Special
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"St. Marys"
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"M.D. Elk"
"Rotex"
"Elk Dust"
"Keystone Dust"
"Rotex Dust"

Elk Service Means Lower Costs

There are two important things to consider in buying firebrick—price and quality. When you buy ELK BRAND FIREBRICK we take a keen, unprejudicial interest in seeing that you get the class of firebrick you need. If a moderate-priced brick fills the bill we never recommend a brick of higher quality at higher price.

We make bricks in all standard sizes and shapes.

Elk Brands Firebrick are reliable. Specify them in your next order.

Elk Fire Brick Company of Canada
Limited

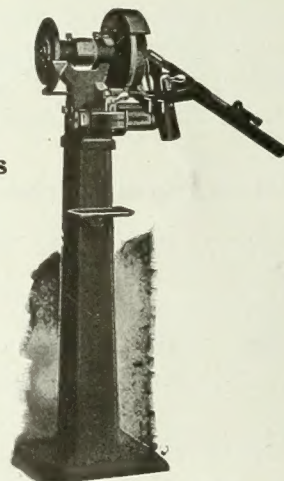
Sun Life Building, HAMILTON, ONTARIO

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Has an Advantage
Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.

The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



American Drill Grinder
For Wet or Dry Drill Grinding
1/8" to 2 1/4". Also
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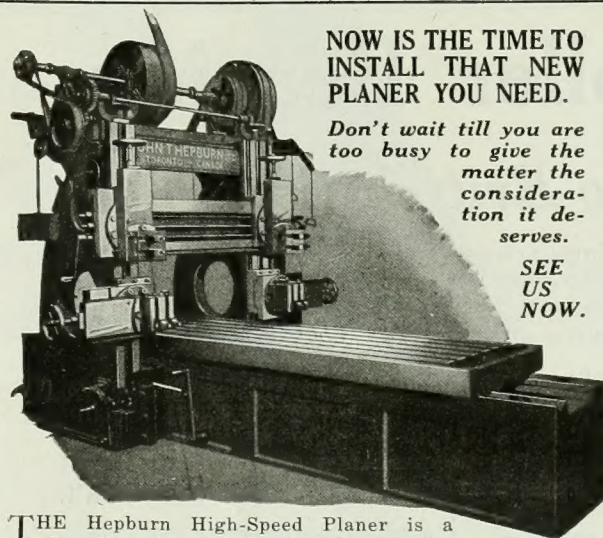
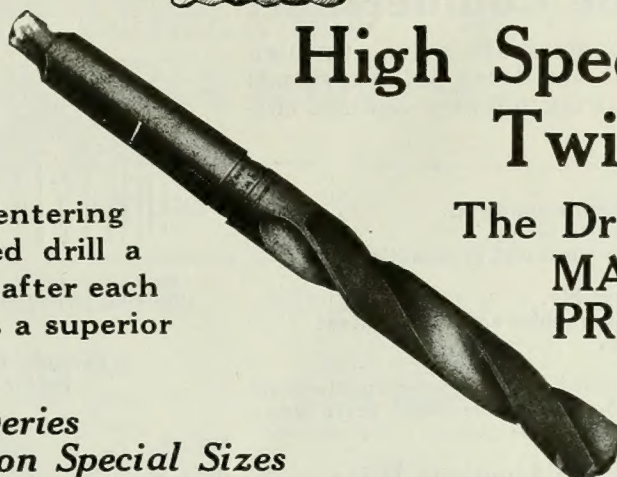


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High Speed Twist Drills

The Drills for
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*All Standard
Sizes Carried
In Stock.*



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*Don't wait till you are
too busy to give the
matter the considera-
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serves.*

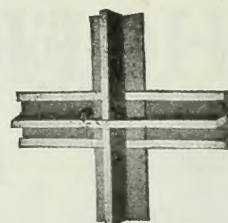
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THE Hepburn High-Speed Planer is a Canadian planer, built of the best material and the workmanship is second to none. Standard size, 42" x 42" x 10' 0". Two or four heads supplied as required. The rack is of cast steel and the pinions are made solid with the shafts. Specification on request. We also manufacture: Power Presses, Hand and Electric Cranes, Pumps, Engines, Special Machinery and Iron Castings.

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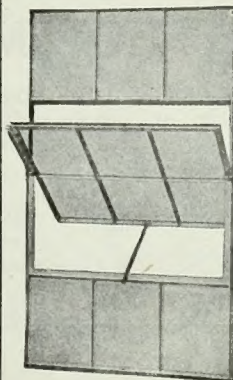
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For all fireproof buildings, including schools and factories.

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The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency:

1. Involves needless equipment.
2. Costs too much to set up.
3. Prevents economical and systematic use of space.
4. Operates sluggishly.
5. Multiplies belt troubles and the resultant cost of upkeep.

Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.

Adopt the Johnson Lineshaft Drive

The economical, efficient and durable method of power transmission through friction control.

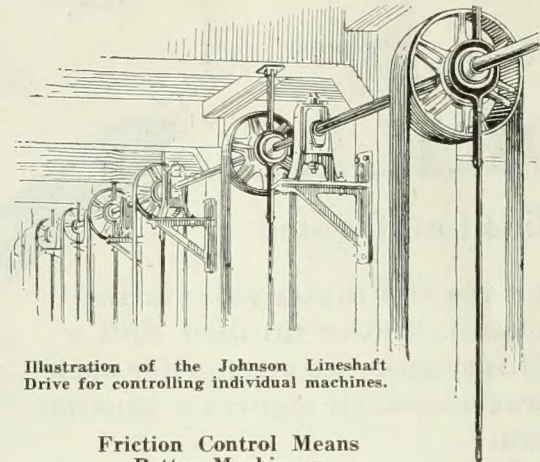
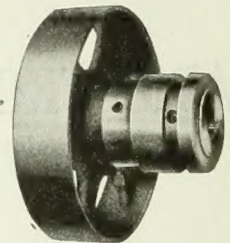


Illustration of the Johnson Lineshaft Drive for controlling individual machines.

Friction Control Means Better Machinery

Whether it is applied overhead or in the machine itself.

Write for our Booklet "Clutches as Applied to Machine Building" and our Yellow Catalog.



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British Made---to British Standards

Hoffmann Roller Journal Bearings are used in locations where loads are too heavy for ball bearings of a size which the design will permit. They carry loads at least 50% greater than will ball bearings of equal size, and run without difficulty at speeds quite as high.

Hoffmann Roller Journal Bearings can be supplied to carry almost unlimited loads, with minimum friction and wear. Bearings in actual service show really remarkable results in freedom from wear or trouble of any kind. This is the result of the extreme accuracy and perfection of finish which are features of all Hoffmann Bearings, both roller and ball.

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are made in one grade only—the best—and every ball is guaranteed within .0001 in. of standard, both in sphericity and size.

We are prepared to supply from stock standard sizes of Hoffmann Bearings and Balls in both inch and metric dimensions. If you are designing new equipment, or having any bearing troubles, our engineers will be glad to advise you.

Sole Canadian Distributors:

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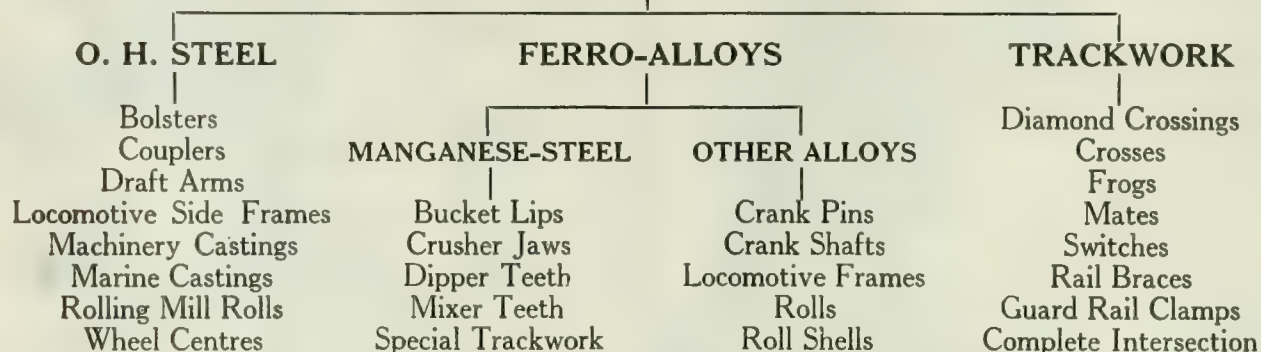
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CANADIAN STEEL FOUNDRIES LIMITED

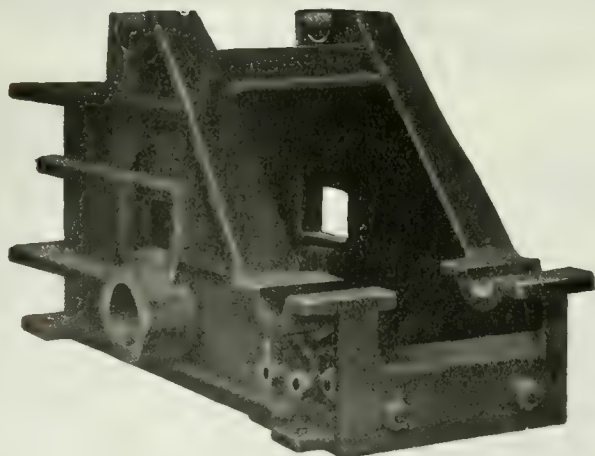
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This list is merely an indication

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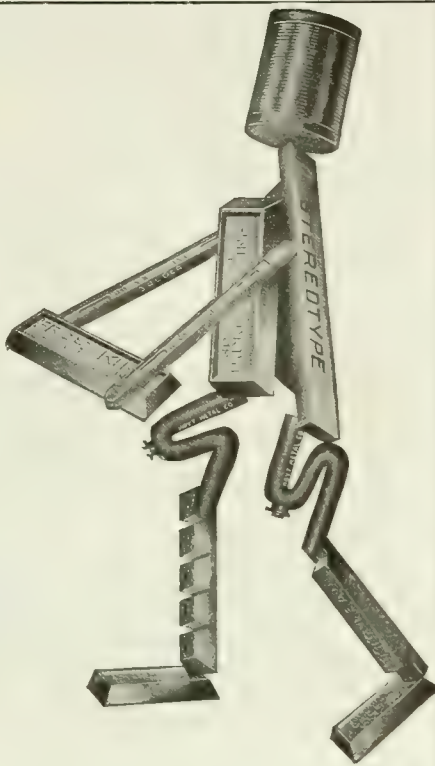
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will withstand heavy pressure without increasing its temperature.

For general machinery bearings it is without a peer.

If you are from Missouri try a sample lot and be convinced.



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ALL STEELHARDENED

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The
HIGH SPEED STEELS

For superior cutting power:

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For all Purposes.

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Solid and Hollow.

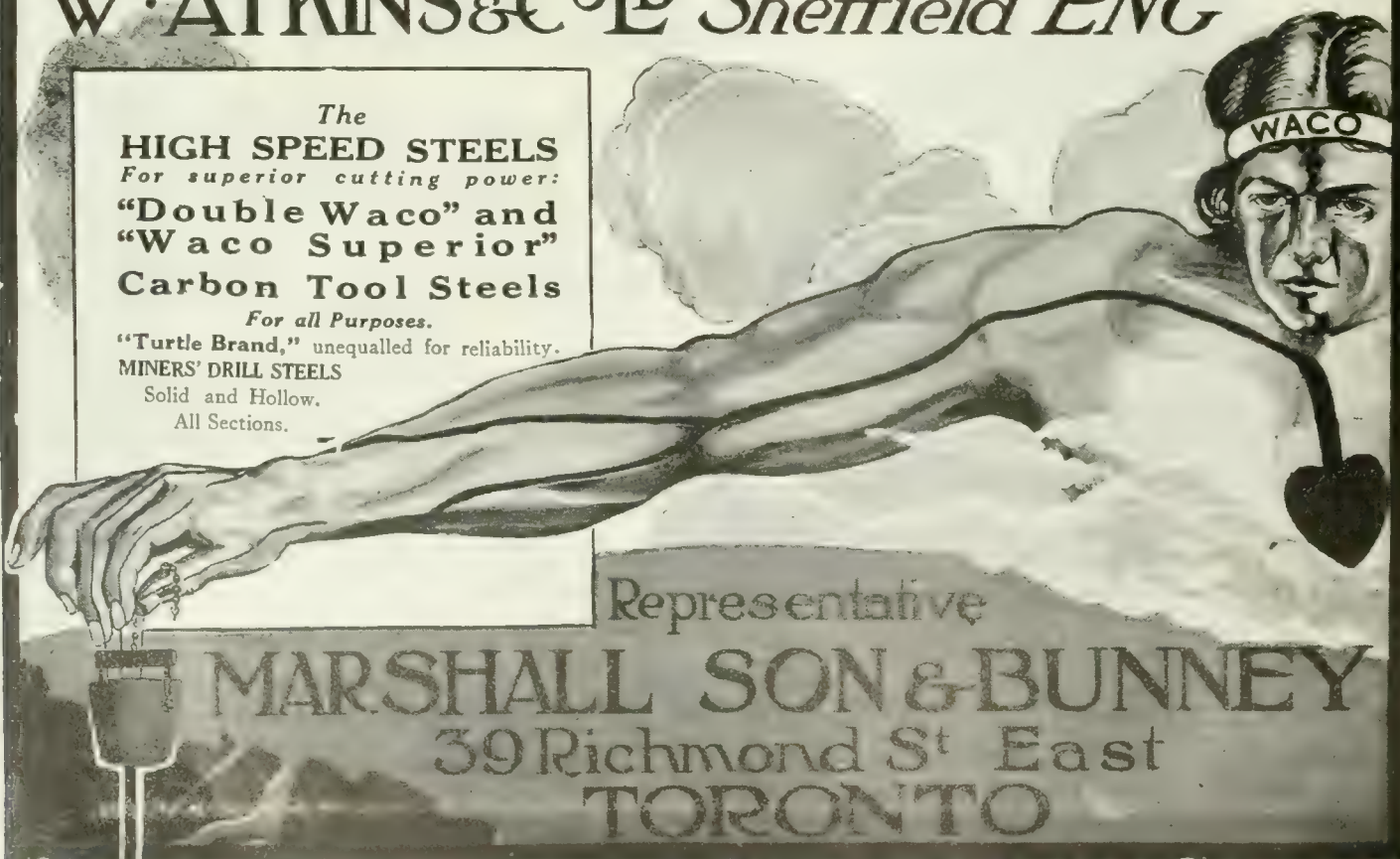
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Bilton Automatic Gear Millers conform to almost every phase of small milling work. Their speed, positive and accurate indexing, and easy control make them economy tools on work such as cutting spurs, bevel metres, taps, cylinders, angle gears, and many other operations.

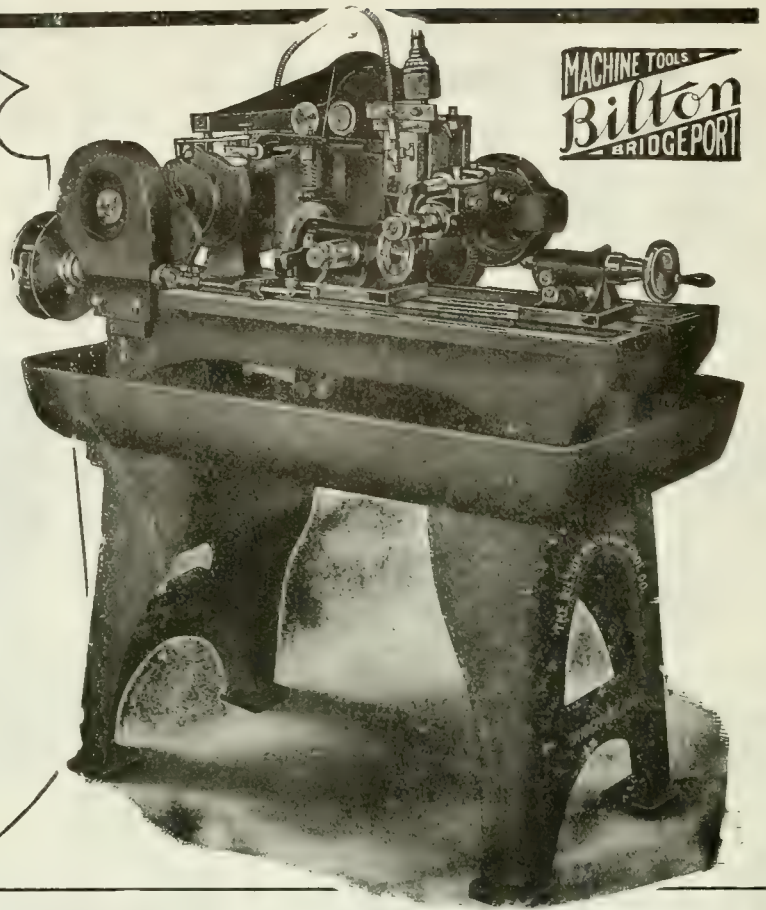
Big business everywhere is adopting the Bilton for high production on accurate work.

May we send you our catalogue?

Bilton Machine Tool Company

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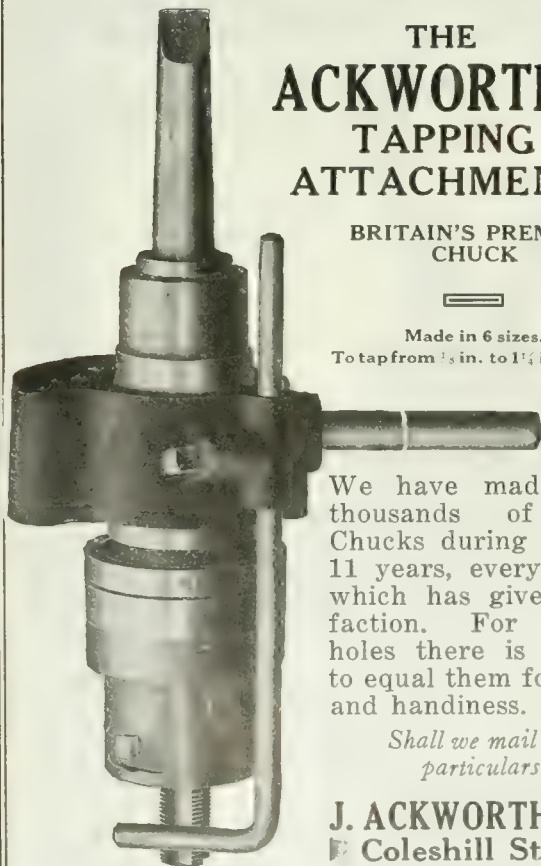


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BRITAIN'S PREMIER
CHUCK



Made in 6 sizes.
To tap from 1/8 in. to 1 1/4 in. Whit.



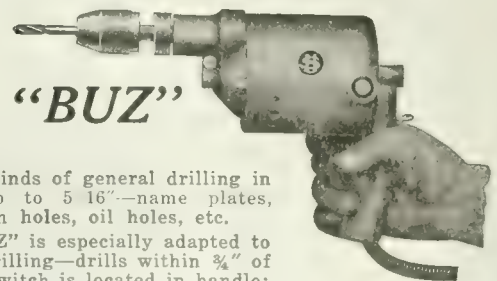
We have made some thousands of these Chucks during the last 11 years, every one of which has given satisfaction. For tapping holes there is nothing to equal them for speed and handiness.

Shall we mail you particulars?

J. ACKWORTHIE, Ltd.
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United States Electric Drills and Grinders

The "BUZ"



For all kinds of general drilling in metal up to 5/16"—name plates, cotter pin holes, oil holes, etc.

The "BUZ" is especially adapted to corner drilling—drills within 3/4" of corner. Switch is located in handle; under absolute control at all times.

Attaches to any lamp socket, alternating or direct current, 110 or 220 volts. Guaranteed the most powerful electric drill of its weight on the market.

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THE UNITED STATES ELECTRICAL TOOL CO.
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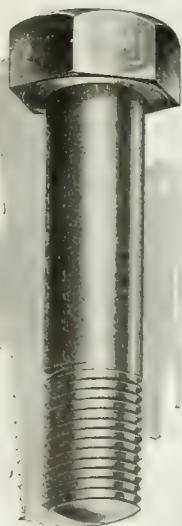
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Your rush orders filled promptly by

The Galt Machine Screw Co., Limited

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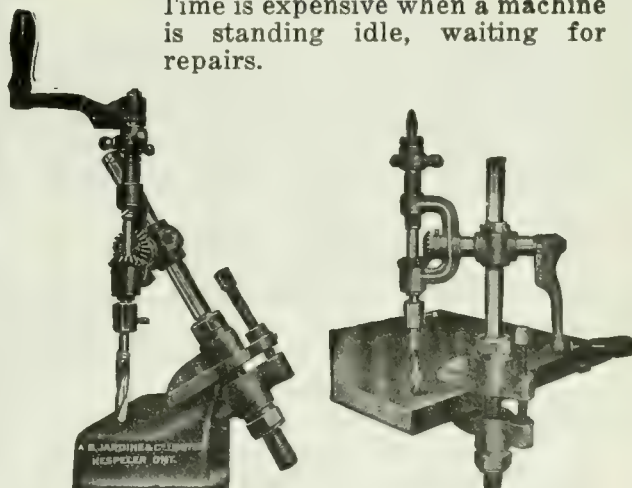
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Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, \$26.50 net.
Sold by all Machinery and Supply Houses.

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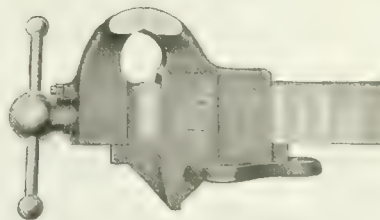
PARKER VISES

PIONEERS 1842

LEADERS EVER SINCE

PARKER SUPERIOR SAYS :

7 Reasons Why--FIRST--CASTINGS

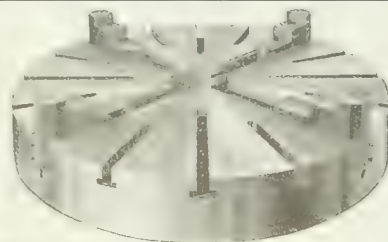


PARKER'S SUPERIOR

A Mixture of Besse-
 mer Steel and Gray
 Iron—the best material
 for strength, quality
 and durability.

**The Charles
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"Master Vise Makers"
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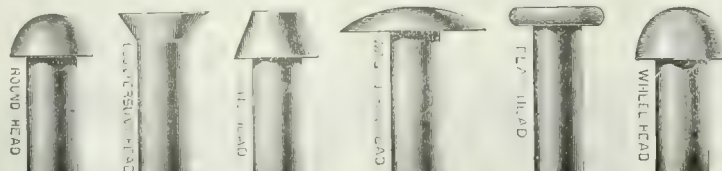
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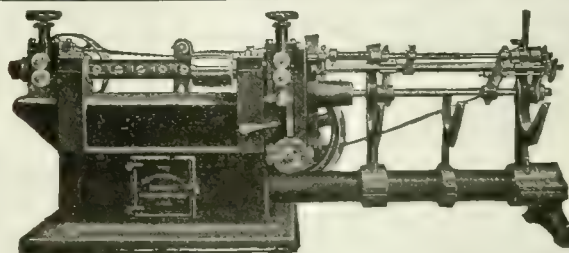
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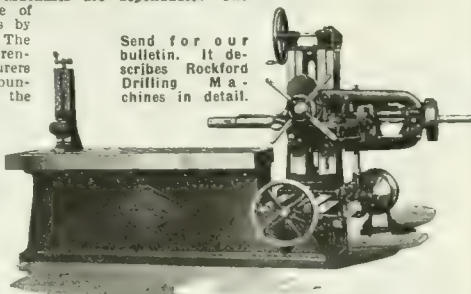
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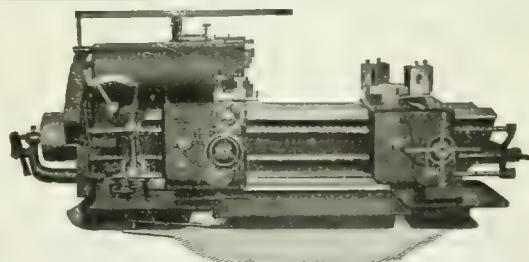
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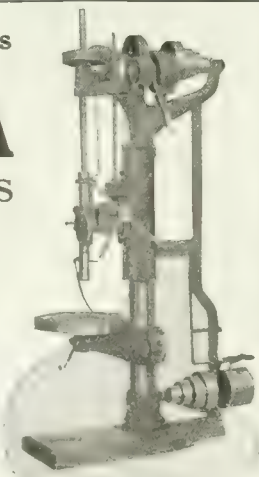
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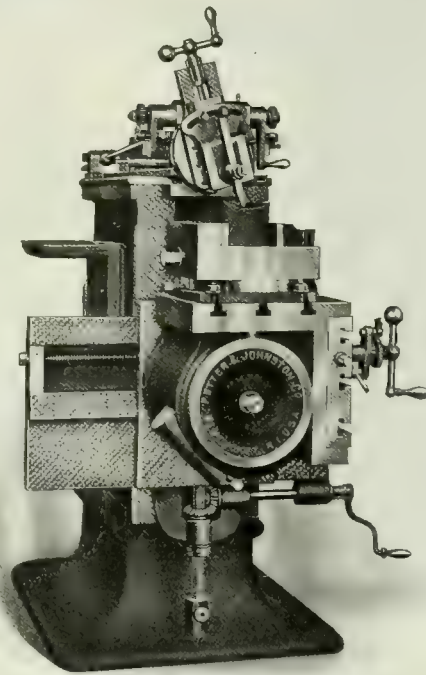
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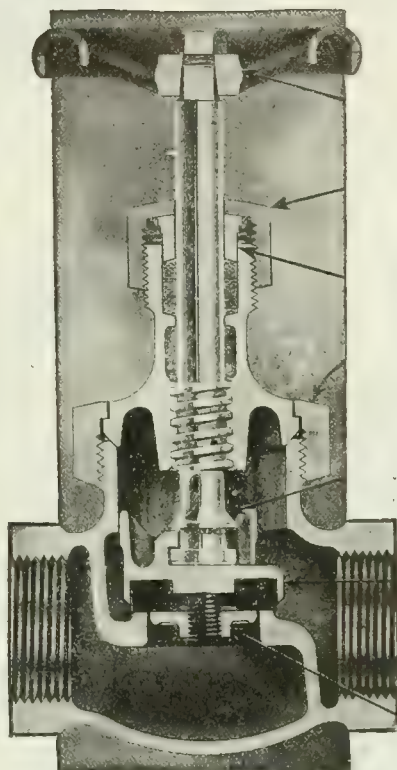
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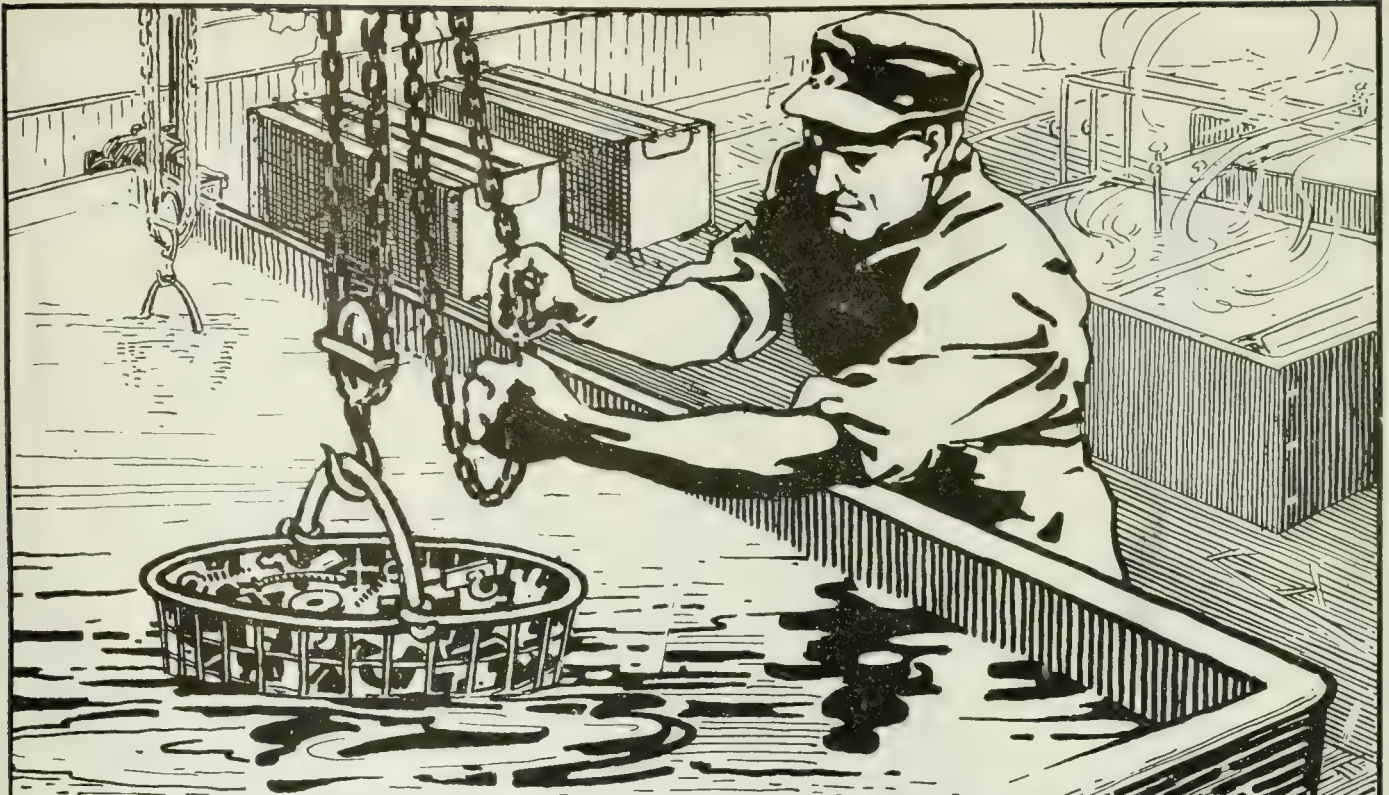
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How easily names slip from the memory when they cease to be given publicity.

There is a lesson here. If you wish your name and the name of your products to be remembered, you must give them constant publicity.

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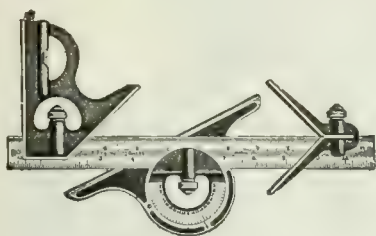
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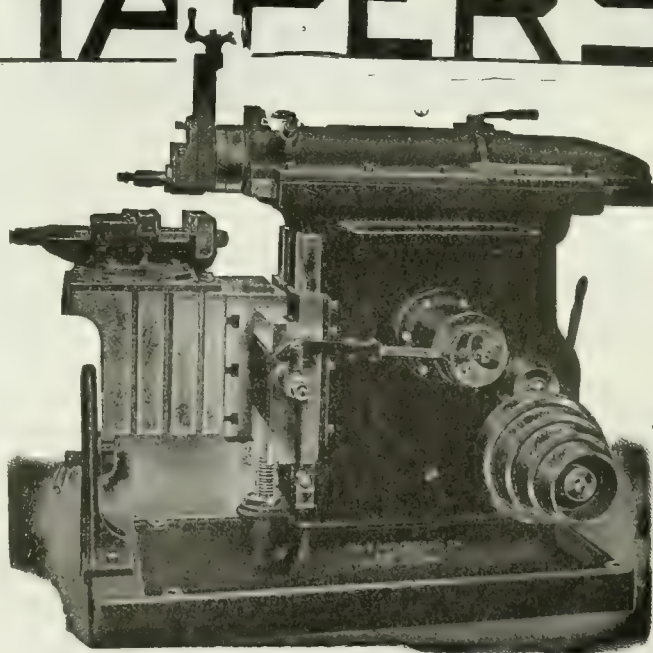
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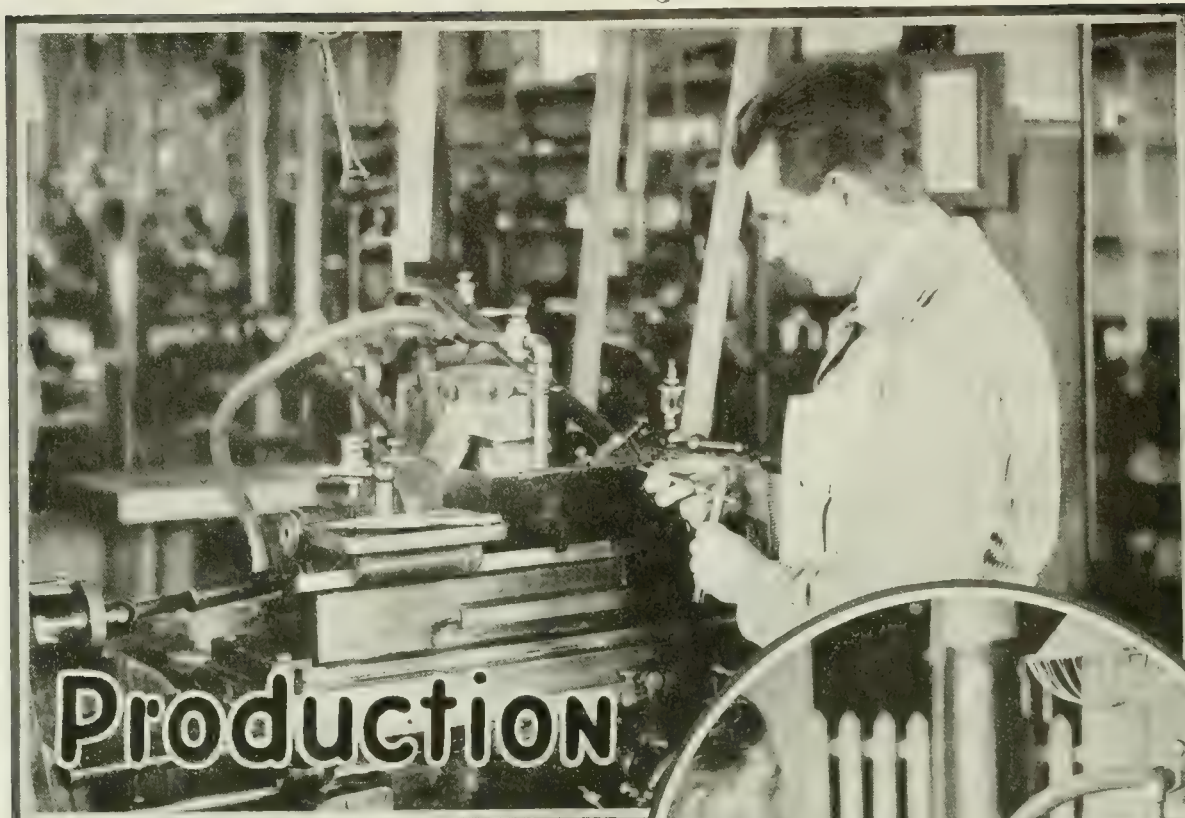
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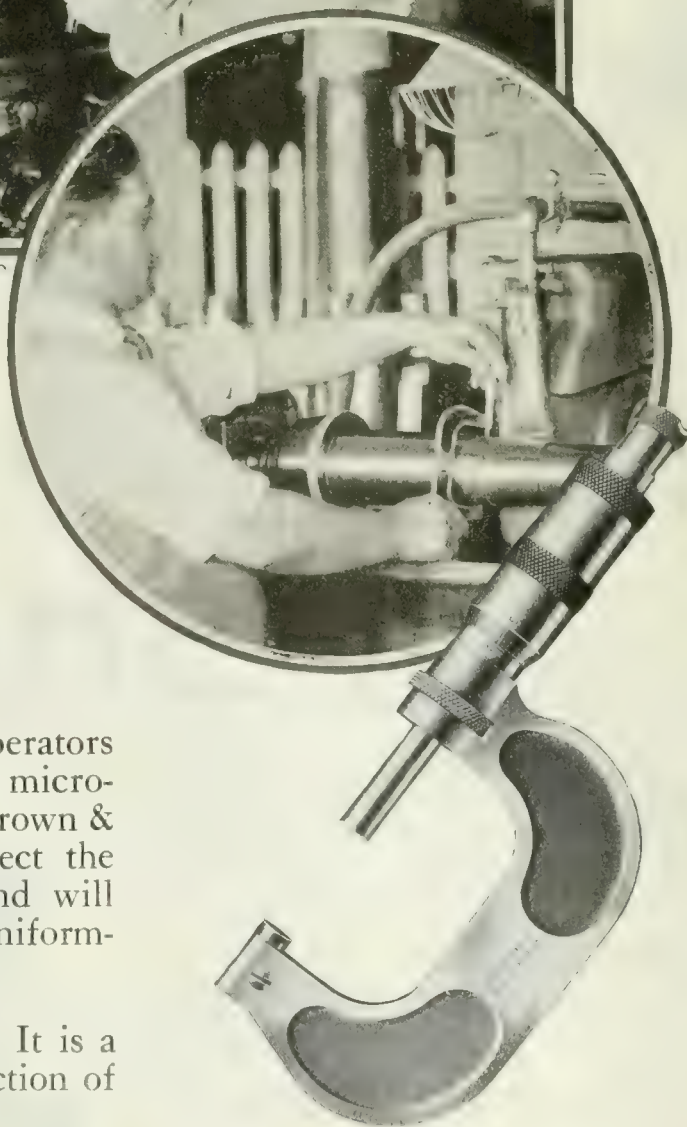


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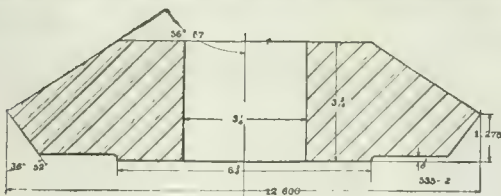
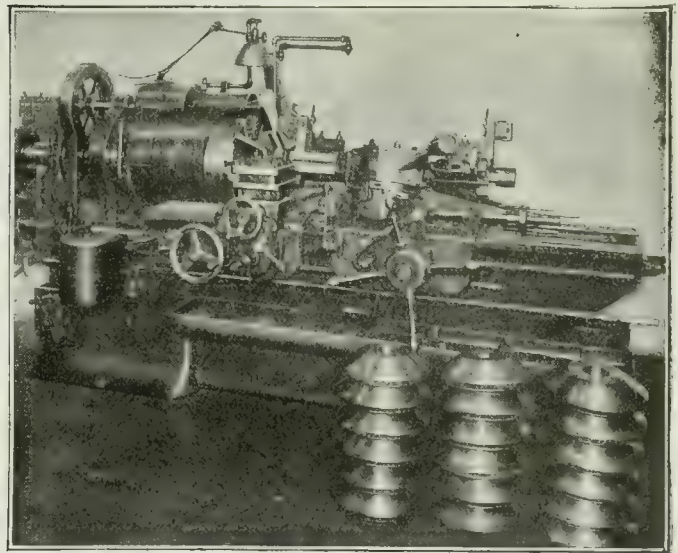
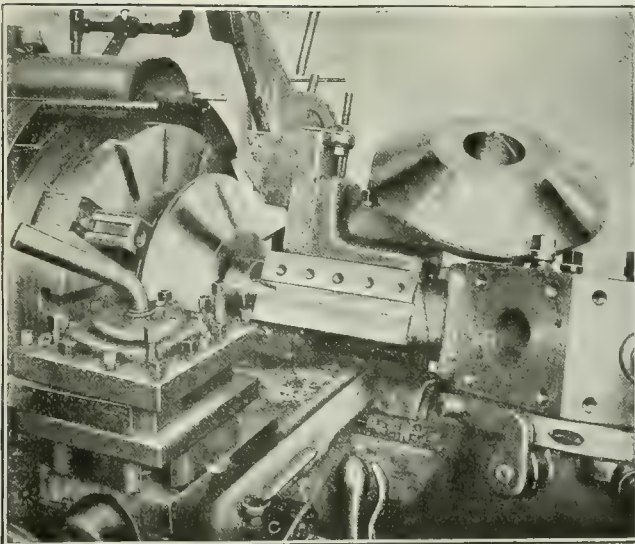
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CANADIAN MACHINERY AND MANUFACTURING NEWS

VOL. XXV. No. 19.

May 12, 1921

Roller Bearing Equipment for Line Shafting

Power Loss, Through Friction in Line Shafting, is a Dividend-Reducing Leakage—It Can Be Avoided—Development of Roller Bearings Has Increased Their Popularity—Points on Maintenance

By J. F. McGUINNESS*

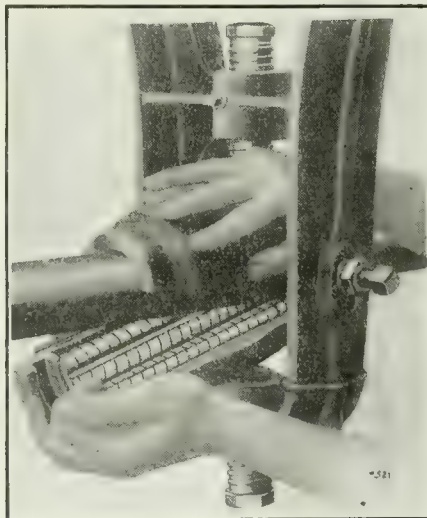
THE question of suitable bearings for line shafts is now receiving a greater amount of careful consideration than ever before, and manufacturers generally have proven for themselves that the loss of power through friction in line shafting is a dividend-reducing leakage that can be eliminated. Let us tackle the proposition from the viewpoint of the manufacturer, the man who pays the bills and is directly interested in keeping down to a minimum the cost of plant operation.

Power Absorption

The line shafts that carry power to the machinery throughout a plant really constitute the arteries of the plant, and as such should be given sufficient freedom in operation to insure proper and efficient distribution of the energy carried to the productive equipment. Every hampering factor, exerting pressure on the shafting, will tend to destroy its efficiency and create a loss of power, which cost many dollars to develop.

It is generally conceded that the friction created by contact between line shafting and plain babbitted bearings supporting it amounts to more than half of the total friction loss between the prime mover and the producing machines, and in most plants this friction load averages about 30 per cent. of the total power used and is reflected in high coal bills or electric power bills. Statistics show that more fuel is consumed in a year in turning the line shafting of the country's manufacturing plants than in the operation of all the railroads.

To such an extent has the magnitude of this loss become evident to mechanical engineers and factory owners that a sufficient demand for better shaft hangers has resulted in the appearance of a number of very good ball and roller bearings, all differing somewhat in design and construction, but functioning in one

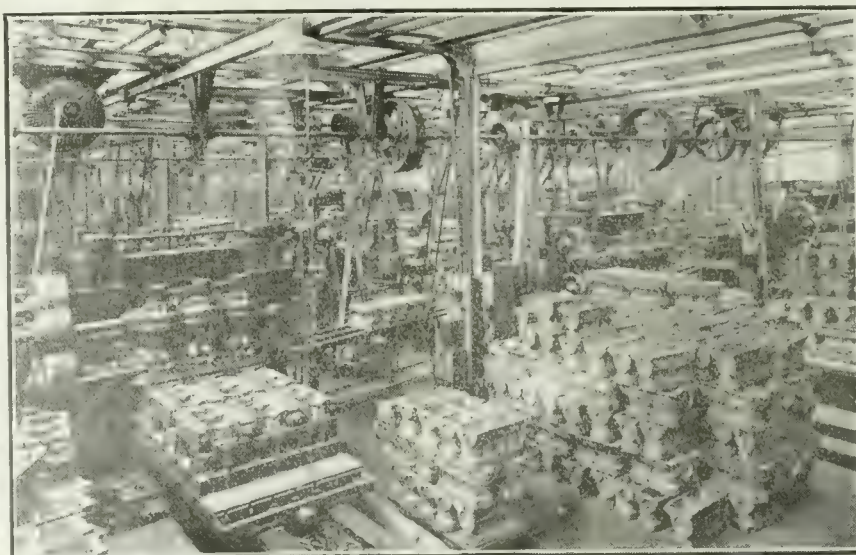


SHOWING HOW SIMPLE IT IS TO APPLY ROLLER BEARINGS TO THE SHAFT WITHOUT DISTURBING THE PULLEYS, COLLARS, OR COUPLING, OR TAKING DOWN THE LINE SHAFT.

direction—providing rolling action instead of rubbing friction.

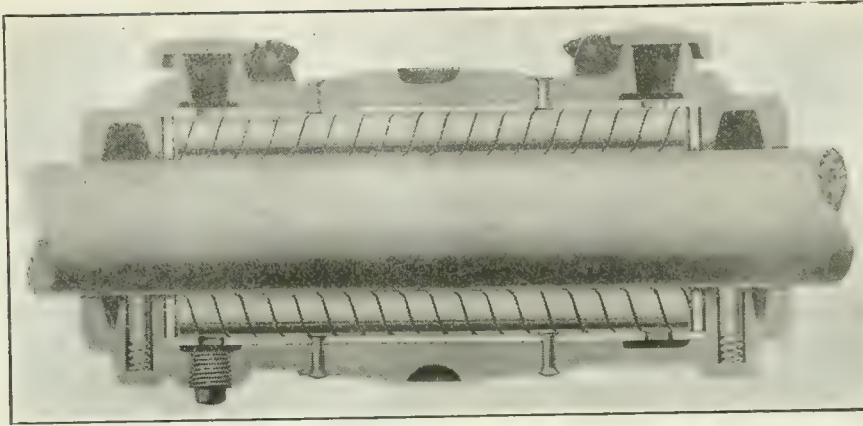
In the pioneer days of anti-friction bearings, the cost of ball and roller bearings for use as power transmission equipment was very high in comparison with that of plain boxes. The cost of power on the other hand was comparatively low ten years ago, so that with these cost factors to consider, the use of anti-friction bearings did not appear as a very attractive proposition to the manufacturer and the idea was naturally slow in taking root.

Development and perfection of the manufacture of anti-friction bearings, and the increased demand for equipment of this character has enabled manufacturers to market ball and roller bearing hangers at prices within the reach of all. Combined with this is the increase in the cost of developing power, power costs on the average being higher than formerly. This figure of cost per horsepower year varies according to locality.



A SMALL PORTION OF THE FORD MOTOR PLANT. NOTE THE METHOD OF SUPPORTING LINE SHAFTING. ROLLER BEARINGS ARE USED EXCLUSIVELY IN THIS PLANT.

*Directing Transmission Engineer, Hyatt Roller Bearing Co.



RELATIVE POSITIONS OF SHAFT, ROLLERS, OUTER RACE AND OILING
RELATIVE POSITIONS OF SHAFT, ROLLERS, OUTER RACE AND OILING
ARRANGEMENT.

With a reduction of 15 per cent. in the cost of power, or, to present it in another way, reducing the cost of each horsepower year, there is sufficient saving to produce a substantial return on whatever investment is made in anti-friction bearings. As the prices vary, however, it cannot be stated here with any degree of accuracy just how long a period is covered before the bearings will pay for themselves on the basis of power saving only. In any case, two years is the maximum time required, although a number of tests have been made showing a return of the investment in half of that time.

Maintenance

In addition to the enormous loss created by friction when line shafting is operated in plain bearings, the cost of oil and oiling labor is worthy of careful consideration. In this respect, plain or babbitted boxes to my mind can be classified as luxuries because of the constant lubricating attention they require. Some of the plain boxes now in use require a charge of oil daily. Others must be looked after at least once a week and there are a number of boxes with devices for storing lubricant so that an oiling once a month is necessary. The average plain bearing, however, requires oiling every week or 52 oilings per year. The slightest omission in lubrication of babbitted boxes, or forgetfulness on the part of the oiler, immediately endangers the plant to the possibilities of interrupted production through hot bearing trouble. Only a small portion of the lubricant used in oiling plain bearings serves its real purpose. The greater percentage is destroyed by heat caused through the development of friction or leaks out uselessly.

With the reduction of friction in ball or roller bearings, a destructive feature is eliminated. With nothing to create waste, no more than four oilings per year are necessary for any type of anti-friction hanger and the amount of oil required for each oiling is no greater than that used once a week with each plain box. Eighty per cent. is a very conservative estimate of the saving in oil and oiling labor where anti-friction bearings

are used, and, as it is with power saving, there are hundreds of pieces of evidence testifying to the low maintenance cost of anti-friction hangers.

General Advantages

The successful manufacturer is the one who strives for highest efficiency on the part of every one connected with his organization. He insists that every employee produce to the maximum or seek employment elsewhere. It is only logical therefore that this idea be carried out and applied to wasteful plant equipment, especially to such equipment that can be easily replaced by units already assembled and requiring very little effort in their installation.

While the direct benefit derived from the use of anti-friction bearings is reflected in power and maintenance charges, it must also be remembered that where line shafting is running in plain bearings, there exists a wear and tear on motors, engines, belting and even on driven machinery, which adds considerably to upkeep costs. With the elimination of the destructive factor responsible for this, the life of belting is materially increased, motors and engines require overhauling less frequently and power is delivered to the producing machinery with greater uniformity, and in greater volume.

In a word, the reduction of the cost of

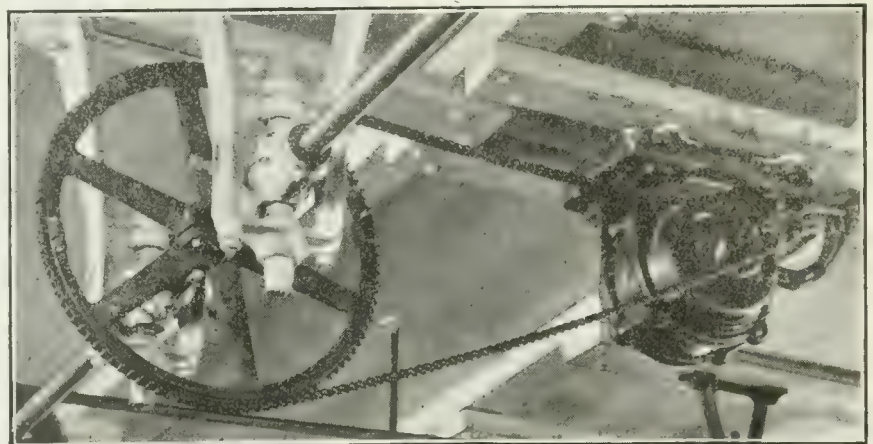
plant operation is so pronounced where anti-friction bearings are in use that the user of power who realizes that he must utilize all of it for the purpose for which it is developed, with the least possible loss, will find it to his advantage to look into the conditions existing in his plant with a view towards placing his transmission equipment on the most efficient basis possible.

THE RECLAMATION OF SCRAP

One good thing that came out of the war was the awakening to the value of so-called scrap material. At a recent meeting of the American Railway Engineering Association, it was shown that at the present time many railroads have special reclamation shops.

A reclamation plant established by the Rock Island lines at Silvas, Ill., has a scrap dock 48 ft. wide and 1,500 ft. long, with six bins 28 x 42 ft. for storing unsorted scrap, eight bins, 28 x 30 ft., for sorted scrap, and 74 bins of various sizes for sorted scrap. Three traveling gantry cranes of 4 and 10 tons capacity have lifting magnets for 1,500 and 8,500 lb. loads. A shop 25 x 270 ft. contains a 100 pound hammer, two 150 pound hammers, double and single alligator shears, bolt shear, rattler for cleaning, drill press, nut tapping machine, four electric welders, four oxygen welding outfits, air-operated shear, and air-operated punch.

This plant is doing such work as welding cast-iron spokes on driving wheels, building up worn spots on firebox castings with acetylene welding; mating and repairing flange-worn steel-tired wheels before turning, thereby saving a great deal of labor; reclaiming salt deposits from refrigerator cars for use in thawing switches during the winter, and for use in fire barrels; pressing oil from waste (one barrel of waste netting about 20 gal. of oil); burning the waste and reclaiming about 50 lbs. of babbitt, reclaiming barbed wire for use in building rip-rap.



THIS STYLE ROLLER BEARING CAN BE APPLIED WITH THE LINE SHAFT, COLLARS AND COUPLINGS IN PLACE.

Various Forms of Die Beds and Punch Holders

Sub-Press and Drop Hammer Type—Beds With Forming Slides—For Round Dies With Extension Backs—Diagonal Post Dies—Spring Pad Arrangement—Pillar or Post Die Beds

By F. SCRIBER

ONE of the most common machines in use, and one, therefore, which is apt to be overlooked, is the punch press. To some this machine merely consists of a surface to set a die on and a ram operating up and down which carries punches. The function of this article is to describe die beds, some of which are in common use, others which are of rather a special nature. It has been the writer's experience that the men who have the upkeep of punch presses are rather prone to adopt one form of die bed or "die holder" as a preference, regardless of conditions, thus sacrificing more advantageous set-ups which can be obtained by taking a broader view of the subject. Before going further, it is perhaps well to define just what is meant by die bed. This, in the sense used by the writer, is that portion of the die which is usually made of cast iron, and into, or upon which the cutting die, which has to be replaced from time to time, is mounted. It is customary to mount this die bed on a bolster plate contained on the body of the press.

Referring to Fig 1, to the left of this view is shown a die holder having a dovetail slot cut across it with screws to hold the die in place. This holder is for simple blanking dies used in making up job lots where small production is required. The die proper, A, is set into the cast iron block B, and is held in place by screws C. Above the die holder is shown a punch holder of similar construction. This punch holder has a round shank D, which fits a hole in the ram of the press, and is operated as a unit thereto. At the right of Fig. 1 is a die holder having a steel gib E, between the die and the

holder, against which the screws F, come. In the punch holder shown above is a tapered gib G. This is for wedging the die in place, a tap on end H, with a hammer securely holding the die or punch in place, while a tap on the opposite end permits the removal of same, it being customary to employ either of the two constructions shown on the same class of work.

Fig. 2 illustrates four types of die beds. A is a cast iron bed having a

square seat, B, in which the dies are fitted and doweled against movement. C shows the same type of die bed fitted with a plain hole D, and elongated hole E. This construction permits of loosening the bolts without removing the die holder from the press, pivoting the same on bolt D, thus bringing the die from under the ram of the press, so it can be removed from the holder for grinding purposes.

In the upper right hand corner is

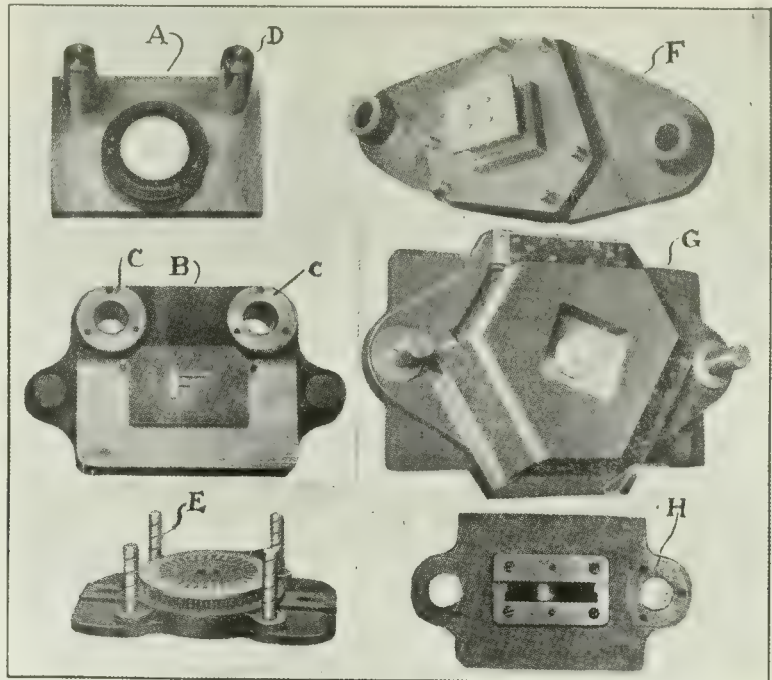


FIG. 4—A GROUP OF PILLAR OR POST PUNCH AND DIE HOLDERS.

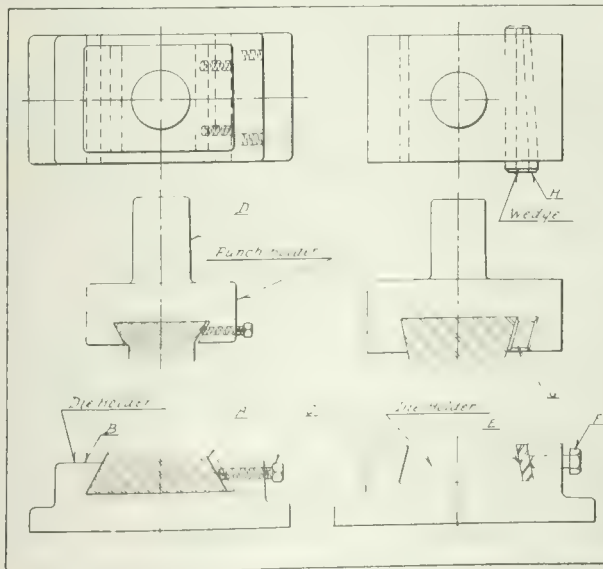


FIG. 1—TWO TYPES OF PUNCH AND DIE HOLDERS.

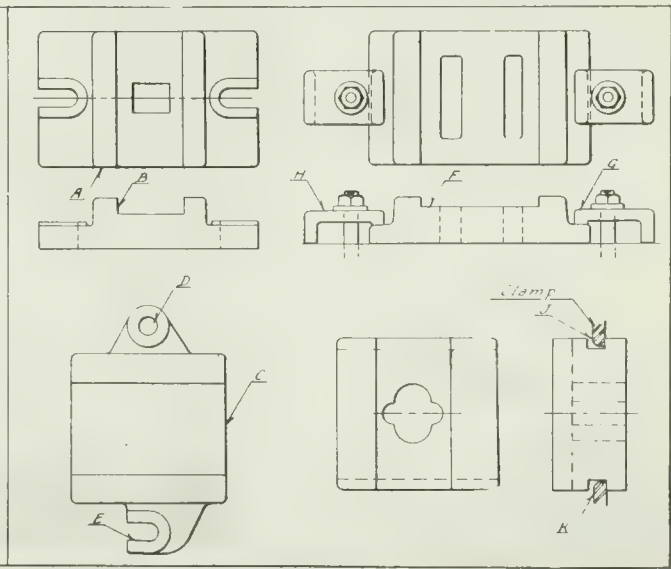


FIG. 2—VARIOUS DIE BED HOLDING DOWN METHODS.

shown a die bed F. This depicts two clamps, G and H, which are used for holding the bed in place. This construction permits the use of a number of different die holders on the same bolster without drilling various holding down bolt holes. It also obviates the necessity of putting holes or slots in the die beds. In the lower right hand corner is shown a die bed which has slots, J and K, cut into it. Clamps may be inserted into these for holding the die bed to the bolster on the press.

Keep in Line

In the construction of die beds as often made, it is necessary for the operator in setting up the press to be very careful and have the punches in line with the dies. In the construction shown at Fig. 3 two steel posts, or guide pins, are provided to keep the two members (die holder and punch holder) in line. The punch, or punches, are mounted on surface B of the holder, while at C are mounted the die units. The posts are provided with oil grooves and the punch holder slides up and down on these posts. The application of this post construction is particularly desirable for blanking and piercing operations, although not so necessary for forming where the natural contour of the form keeps the punch and die in alignment. Posts of this design are shown at opposite corners, and the group of die and punch holders shown in Fig. 4 are of interest in this connection, as they illustrate varied applications of these die holders. At A is a punch holder containing two posts at the rear, below this at B is the die holder used with the punch. In this die holder are certain bushings, C, and posts, D, slide in these bushings. At E in the lower left hand corner is a die holder containing four posts, while in the upper right hand corner is a holder having two post holes directly opposite on the centre line. This holder is indicated at F. At G is the die used for this work. In the lower

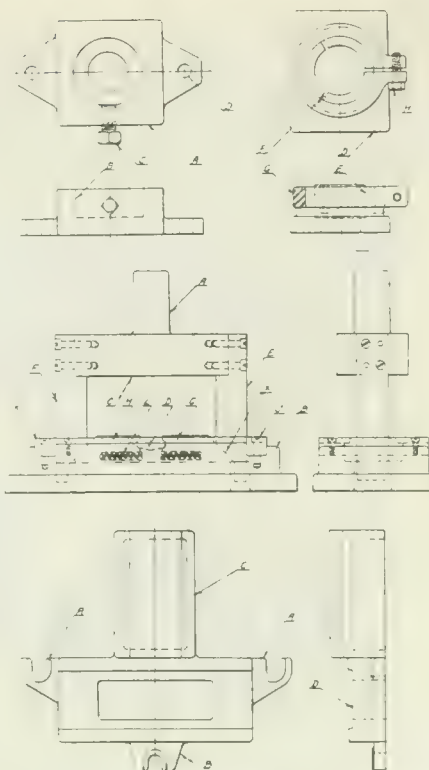


FIG. 5—TOP VIEW SHOWING TWO DIE BEDS FOR ROUND DIES.

FIG. 6—CENTER VIEW SHOWING DIE BED WITH SLIDES FOR SIDE FORMING.

FIG. 10—BOTTOM VIEW. DIE BED WITH EXTENSION BACK.

right hand corner at H is a small die holder, in which the guide pin holes are bushed and are directly opposite on the centre line. It is preferable where two guide posts are used to have them either as shown at F, G and H at the centre, or as shown in Fig. 3 diagonally opposite.

If diagonally opposite, the stock from which the blanks are made can be fed through on the centre line the long way of the die holder and be clear of the posts, a condition which is obviously impossible where the die is constructed as shown in F, G or H in Fig. 4. This

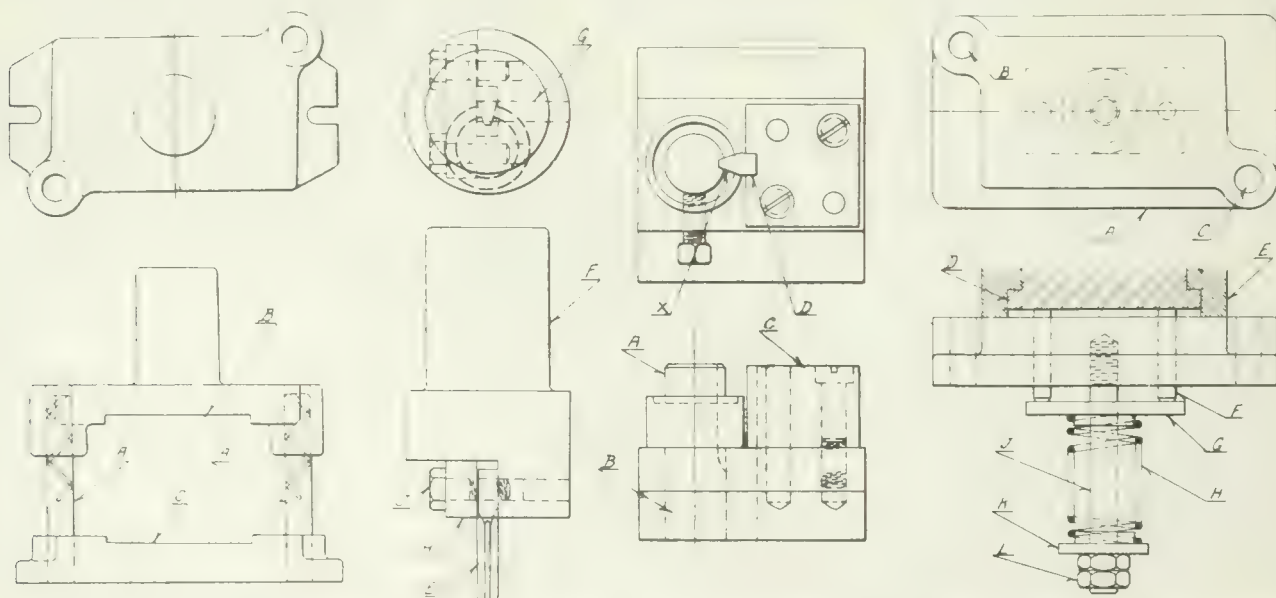
condition is merely pointed out as one to be guarded against in die design, as, of course, it was not necessary to feed the stock in the aforementioned manner when using these dies. When using die and punch holders with two posts at the rear, there is a tendency to have the slide member clamp on the post, where there is lost movement in the slide of the press, while where four posts are used it involves more work in making the die bed, while the die surface is not as accessible.

Two constructions especially adapted for holding round dies are illustrated in Fig. 5. The first of these at the left shows a simple holder A, counterbored at B, to receive a die which is held therein by a set screw C. This holder has two holes, D, for holding it to the bolster plate of the press. It is frequently the practice to omit the screw C and hold the round dies in place with filister head screws from the top. At the right of Fig. 5 is a holder made of steel and indicated at E. This is also counterbored to receive the die at F and has three saw slots, G, cut into it. Over the outside of holder a split collar, H, is mounted, and with the die in the hole, E, tightening of split collar with bolt, H, securely holds the die in place.

Other Examples

With one or two exceptions the foregoing illustrations have been devoted to detailed description of die holders. In the remaining views are shown arrangements which involve a description of some of the operative units of die construction. No attempt will be made to show definite applications of the tools to the work, that being outside of the scope of the present article.

Referring to Fig. 6. This shows at the left a sub-press type of die holder, while at the right is a drop hammer die holding arrangement. In the case of the drop hammer the die holding mem-



READING FROM LEFT: FIG. 7—DIAGONAL POST DIE BED. FIG. 7—ARRANGEMENT OF SIMPLE PUNCH AND DIE HOLDER. FIG. 8—DIE BED CONTAINING SPRING PAD ARRANGEMENT.

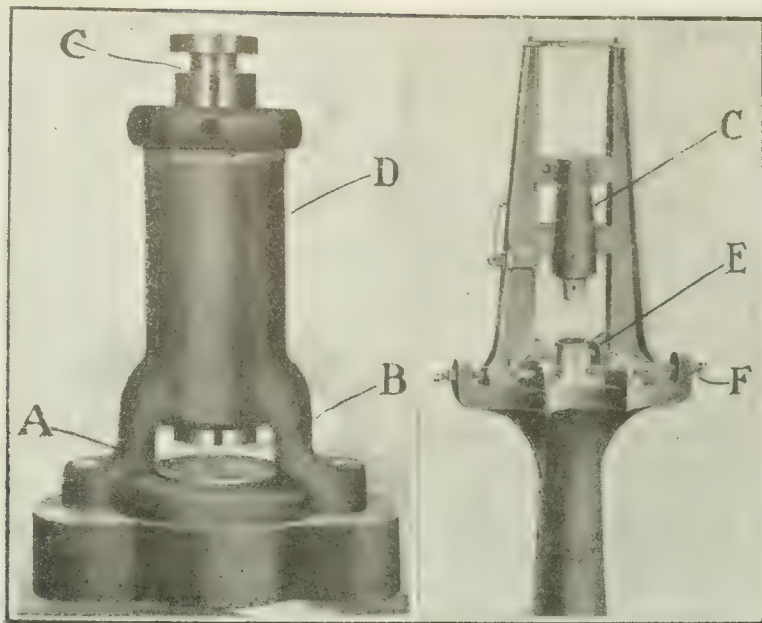


FIG. 6—TWO FORMS OF DIE SET-UPS. LEFT, THE SUB-PRESS TYPE. RIGHT, THE DROP HAMMER BED.

ber is built permanently into the machine. Referring to the sub-press type, the die is located at A, while suitable punches are placed in the plunger B. This plunger is attached to the ram of the press at C, and slides up and down in the bracket D. This holds the die and punch in alignment and adjustable bearings are provided to hold plunger snugly in the body of the sub-press. This type of die holder is used mostly for small accurate work.

Again referring to the drop hammer type. Die E is held in place by screws F, which are contained in lugs on the body of machine. The ram G contains the punch, and it is customary in using this tool to raise the ram, letting it drop by its own weight to perform the work. An arrangement of a die and punch holder where the units are all made of steel is illustrated in Fig. 7. The construction of this is rather simple and embodies principles of good design. The die A consists of a round stud hardened and drawn to the proper temper. This is mounted in a steel block B. At C is another steel block, which is cut away at D, so that it will back up the punch, which cuts a tapered slot as indicated at X, when the punch descends. It is a simple matter to renew the die A while retaining the other parts, B and C, thus reducing the repair costs to a minimum. The punch E for this die is mounted in a steel holder F, which fits into the ram of the press. This punch slips over a dowel pin G, held on the holder F, the holder being grooved out to receive the same. A steel clamp H, held in place by two screws J, securely holds the punch in place, all of which makes a very substantial arrangement for performing the operation shown. In the design of numerous types of dies it is often necessary to incorporate a spring pad. This is particularly true where blanking and

forming operations are performed in the same die.

Figure 8 illustrates one method of arranging the die to accommodate such conditions. The die holder A, made of cast iron, contains two guide posts at B and C. The spring pad is indicated at D and this is retained in place by an outer ring or block E, which limits the upward movement of the spring. Two pins, F, pass through holes in the die bed and come against a plate G. Against the underside of this plate is a spring, H, that is attached to a stud J, being held thereon by a suitable collar K and check nuts L. When the ram containing the punches descend, the spring pad D is forced down, thereby causing the pins F, through the medium of the plate G, to compress the spring, which is held to the underside of the die body by the stud J. When the ram comes up the spring, pressing against the plate G, forces the spring pad D back to its original position, as shown. Rubber is quite often used in place of the spring for this purpose and it is also quite common to put springs directly under the spring pad D in the cast iron die bed A.

Another complication often met with in press work is the necessity of forming from the sides of the dies. This is usually done in conjunction with a form made from the top, and to illustrate one of the principles of construction used for such work let us refer to Fig. 9. In this illustration A is the punch holder, which is attached by a round shank to the ram of the press. B is the die holder. Attached to surface C of the punch holder would be some form of punch that would make the shape desired. This would be made with a spring pad, so that when it bottomed on the surface of die D, it would remain stationary while the punch holder would continue to descend. This would cause the plunger E and F, which

have beveled surfaces on their lower ends at X, to force slides G and H towards the centre surface D. These plungers are backed up by steel seats J and K, while two springs, L and M, are used to keep the sliding members apart. Forcing these slides, H and G, in causes the slides to form from the side, thus in this construction we have three functions performed, that of forming from the top, and from the two sides. The slides, H and G, are sometimes made as side forming punches, and on other occasions are made with punches attached to the slides. It will, of course, be understood that various modifications of this design, embodying one plunger, four or even more are employed in die design to suit the particular job in hand.

Referring to Fig. 10 we see a die body which is held down by three bolts, two of which are at the sides A, and one directly in front at B. This has an extension at the back C, the construction being one that is sometimes used for holding a die on surface D, while the extension C would be used for holding necessary associate parts of the die that have to withstand very little of the cutting strain usually imparted in die works.

In die work the best rules of construction cannot be laid down, as similar methods cannot be employed for making anything from metal buttons to automobile bodies. The type of press and large extent govern the features incorporated in the design.

POINTS FOR TWIST DRILL USERS

If the drill chips on the edge it indicates that the lip clearance is too great and fails to support the cutting edge. This may be because the drill is too hard. It is advisable to ease off on the feed and watch the grinding.

If it splits in the web, it is either ground with improper centre lip angle or the feed is altogether too heavy. The centre lip should be at about 45 degrees to the cutting lips of the drill. The drill is in best condition when the chip comes in a close coil.

If the outer corners wear it shows that the speed is too high and it should be reduced. This is particularly noticeable in drilling cast iron.

Drilling cast iron can be done at a little faster speed than for steel, but the corners must be watched.—Belts.

SHOP FLOOR BUCKET

A new type of bucket for use in machine shops or foundries has been introduced by a Cleveland manufacturer. The bucket is retained in a hole especially constructed for it in the floor of the shop and scrap is easily swept into it. Fitting over bucket is a cover of 5-16 inch steel plate which gives a level surface, permitting the operating of trucks over it when closed. An overhead crane raises the bucket from the hole and it is carried to a storage dump where it is emptied, or directly to cars which haul it away to the dumping place.

Taking the Machinery Out of Promotions

Reward the Man Who is Really Trying—Take the Mystery Out of Promotion and Rewards—Get a Rating on the Man Independent of His Own Opinion of Himself

By WALTER A. WILLIAMS

THE president of one of America's largest and best known industries, said recently: "Right now, today, is the time to take inventory. Not just an inventory of parts and goods and stock, but of the human element. It is a good time to get rid of mental cobwebs, outworn business customs, wasteful habits, and also wasteful, inefficient people. From now on there is going to be man's work for everybody who is willing. Each one of us will have to do more work, and do it better. It is a time to get rid of the slackers and to reward and promote the fighters. For the rest of 1921 is going to be a fine year for fighters."

Now those are good words. They sounded good when heard. They sound good now because they are true. But they have a challenge for every man in business. It is easy enough to get rid of Miss Johnson, who can't manage to get in on time, or to fire Pete Smith, who never did take any interest in his job, but it is just as essential to reward the man who is really trying, to find out who the fighters really are, to take the chance and mystery out of promotions and rewards. Here is the case of Bill Green, for example.

Bill Green doesn't push himself forward. Maybe he lacks what some people call poise, others brass. Yet his type,—the workman who wants to get ahead through better work, who wants to earn his pay and a lot more besides,—is our most valuable national asset to-day. Anyhow, Bill wants an ever-increasing standard of living. He wants to give a full day's work for a full day's pay, and then do a little extra to earn this standard. He doesn't see how he is going to get these facts across to his chief. Nobody in authority knows, for instance, how Bill saved his concern big money when he cut down to seventeen minutes an operation which used to take an hour and a half. When he told his wife, Mary, about designing that new method of joining parts, and they figured out the saving to the firm as almost \$16,000 a year, both agreed that Bill deserved promotion. But Bill's foreman, in what happened to be a machine shop, was interested primarily in getting credit for the saving in labor costs as shown by the figures in his own department. He was a good mechanic, was this foreman, but a poor leader of men.

Now, Bill and his kind are numerous, and they are discouraged. They see men getting laid off, but they know they are earning their pay and more. They want to get ahead. They get more

discouraged when some man is promoted over their heads because of an accidental discovery by the big chief,—or some other reason which Bill doesn't understand and can't see any reason for. And these mysterious promotions, this lack of some definite method of appraisal of the latent human material in a plant, is one of the most important questions facing every employer to-day. Getting rid of inefficient workmen is important—but promoting the right kind insures future efficiency and is more important still. It makes no difference whether you have an office force of sixteen people in a small town bank, or own a factory em-

POINTS BROUGHT OUT

This is a good time to get rid of mental cobwebs and wasteful habits, for the rest of 1921 is going to be a fine year for fighters.

Reward the men who are really trying. Make no mystery about their promotion. Tell the men you appreciate their efforts, and reward them according to their worth, their true worth, not always what they themselves believe they are worth.

Base your salary on actual ratings, not on guess work. Keep tab on the men's activities. In other words "kill the mystery by means of mathematics."

Let a man have easy access to his rating record. In many cases he can strengthen himself where he is weak, and by hard study and conscientious effort can make real progress.

playing eighty thousand hands. Some method of taking the mystery out of promotion, some means of getting a rating on a man, independent of his own opinion of himself, and regardless of accidental discovery, is essential if real esprit de corps and morale are to be maintained. And a really sound basis of business prosperity instead of boom times requires better individual efficiency which comes from high morale.

One concern has done a thing which seems obvious and practical, and it seems to contain a suggestion for every man who employs other men in any capacity. The Boston branch of a nationally known automobile company adopted a plan which does take the mystery out of promotions. And the curious thing is that this concern merely took the best plan in the world for its own use. When I say the best method in the world it isn't quite the exaggeration it sounds because it

was the final plan worked out after the best brains in the country had been called in for advice. It is a practical business adaptation of the plan adopted by both the army and navy during the war, to keep in close touch with the latest ability of its officers. Why more concerns haven't stolen the idea, nobody knows. For human nature in industry is the same, and men respond to pretty much the same incentives.

With this concern, it is applied to foremen, sub-foremen, inspectors, and testers, with possible later extension to more subordinate positions. There are now in this concern certain and sure means of discovering relative abilities and shortcomings, and rewarding accordingly; of uncovering dissatisfaction before it starts; of building up a real organization morale so important for making a better product and making the concern a better place to work.

The rating plan used is really a modification of grading proficiency in the various studies, such as those old-time school reports which used to worry us. The qualifications required for each position are carefully analyzed and listed, and the individual is rated on each item with the percentage of his attainment in comparison with the possible. Each qualification is considered in its part relation to the whole. A typical rating scale as used by the army and adopted for industry might read as follows:

Rating Scale for Foremen

1.—DEPARTMENT ABILITY.

Consider kind and amount of experience; knowledge and resourcefulness in using machines, tools, materials, and trade methods.	Highest...15
	High....12
	Middle... 9
	Low..... 6
	Lowest... 3

2.—ABILITY TO PLAN AND SUPERVISE.

Consider ability to maintain standard quality work; to place help where they can do the best work; to plan ahead, so as to have materials, men and tools ready to get out orders on schedule time with minimum production costs, and to keep a steady force.	Highest...25
	High....20
	Middle...15
	Low....10
	Lowest... 5

3.—ABILITY TO HANDLE MEN.

Consider initiative, decisiveness, resourcefulness, energy, self-control, and ability to deal fairly with his help; to earn their respect, good-will and confidence; to maintain just discipline and a stable working force.	Highest...15
	High....12
	Middle... 9
	Low..... 6
	Lowest... 3

4.—ABILITY TO TEACH.

Consider his ability to explain his work clearly and thoroughly to a beginner; to gain the beginner's confidence and make him interested in the work; his success in developing all-around men, bettering men of lower grades, and increasing generally the knowledge and skill of the help under him.	Highest...15
	High....12
	Middle... 9
	Low..... 6
	Lowest... 3

5.—GENERAL VALUE TO THE COMPANY.

Consider his years of service, his loyalty, his ability, to understand and carry out the company's policies; orderliness of his department; his readiness and ability to co-operate with other departments and the management in giving new ideas and methods a fair trial.

Highest	30
High	24
Middle	18
Low	12
Lowest	6

This plan, of course, can easily be changed to fit any man who has other men under him. The chief clerk in an office or the assistant manager of a department store might have different qualities and percentages which can be substituted. The sum of ratings is 100 per cent. General value to the company, the most general title, is placed highest with a rating of 30. Other qualities are considered worth 15 points apiece, except ability to plan and supervise, which gets 25.

All men in the company now coming under the plan are rated against these scales, revision of ratings taking place every three months. Salaries are based not on guess work, but on the actual ratings. An increase in total points of rating means a sure increase in the pay envelope. To show that the plan has actually increased morale, it may be mentioned that average ratings have increased about 35 per cent. in the year during which the plan has been used.

Promotions also are always made on the basis of ratings. The several candidates are measured by the scale, taking into consideration the requirements of the new position, and the promotion made absolutely on the basis of points. Thus mystery is killed off by mathematics, and the chronic grouch is left without a leg to stand on when another man gets the job he wanted.

A Typical Case

Not long ago a new foreman was needed in the plant. On the old basis, the natural way would have been to promote the assistant foreman of the department or bring in a new man from outside for the job. Instead, the rating scales were studied and from these three possible names were selected. Two were at the time assistant foremen of departments, the third was employed not in the shop, but in a totally different department, the sales inspection. His was the job of meeting the customers who brought in cars for repair. These three men were each rated for the new position by three of their superiors independently. Then they were brought together, informed they were candidates for the position, and asked to rate each other by the same scale.

Curiously enough, at least from the cynic's point of view, the one receiving the highest estimate from the three superiors received nearly the same rating from his two rivals. It was the man holding the position of sales inspector; and he received the promotion in consequence. The three candidates shook hands all round, declared the choice to be fair, and the assistant foreman of the

department, who was one of the candidates, went to work under the new boss with increased "pep"—he knew he had been given a square deal.

This brings up the most important feature in the application of the new plan—the method used in determining the ratings. To prevent possibility of unfairness, each man is graded by three people, eliminating the element of personal prejudice, favorable or unfavorable, conscious or intuitive. To reduce the influence of personality still further, a practical plan has been worked out by which all graders operate on the same basis. The comparisons for grading are made not against some nebulous ideal like a star in the Einstein theory, but against definite individuals. Observe that on the rating scale are five gradings for each qualification. Let us imagine that the particular quality is "Ability to Plan and Supervise." Quite a good quality, and one which every man has in some small or great amount. The grader runs through in his mind the names of a dozen men in similar positions, selects the one he considers to be most expert in this respect, and writes his name opposite the word "highest." He picks Pete Johnson, for example, who married his oldest sister, for this honor. Opposite "lowest" he sets down the name of the individual whose attainments in this phase of the work are least—Henry Dubb, let us say. He does the same with "middle," "high" and "low." There are now five names with abilities running from highest to lowest on this chart.

"The names of the highest and lowest," read the instructions, "must represent extreme cases—the best and the poorest you have ever known. The name for the middle should be that of an average foreman, for example, half way between the extremes. High and low should be half way between the middle and the extremes."

The grader now compares his estimate of the foreman being graded with these definite individuals. Thus he estimates that Henry Jones, who is being graded, is equal in planning and supervising ability to Dave Henderson, whose name he finds written opposite high on the schedule. Jones, therefore, receives a grading of 20 in planning and supervising ability.

In this way results are certain to be comparatively true. Foremen, understanding the method of making the ratings, are convinced that the figure is fairly arrived at and represents a correct estimate.

Men Are in on It

Another step to kill off mystery should be noted, and it is an important one. Men are free to inspect their ratings at any time and discuss them with their superiors. Executives are enabled thus to point possible roads to development. The great virtue of the ratings here is in permitting the matter to be discussed in detail rather than in mere generalities, and giving the man the chance to

develop a quality as he would a muscle.

One man who was an inspector desired to be promoted into the sales department. His rating scale was discussed with him and he was shown to lack the right kind of selling personality. Properly guided, he set out to develop an agreeable manner, and to build up on points where he was weak. Through reading, hard study and real, conscious evolution on his part he made progress. He called in the evening on men he knew who were salesmen and studied them. In four months he earned a better rating and got the promotion he wanted.

As a corollary to the rating plan, promotion charts were drawn up to indicate possible opportunities for advancement in position in addition to wage increases in positions then filled. Most men felt that, having reached a foremanship, they had arrived at the pinnacle of their career—there was nothing beyond to which they might aspire, and this feeling is general in many concerns. It is a real ambition killer. To one of these men there were shown at least five possible positions ahead if he could earn them. The promotional opportunities laid out in diagram presented them visually and impressively and gave a real incentive. One showed, for example, that when a man reached the position of sales inspector, two roads were open for him ahead, one in the direction of shop foreman, the other in the direction of sales of new cars, used cars, or trucks. In every other industry, this pointing out the path ahead is possible and it will always increase morale.

Practically all men are being promoted in this plant from the inside. Any man who has worked in a place where all good jobs were given to outsiders will realize what this means in better team-work. Promotion of a sales inspector to foremanship created five promotions down the line. Each time an advance is made a bulletin is issued announcing it. This is the kind of publicity that helps Babe Ruth knock more home runs, and the promotion is given a real dignity. It also helps to bring home to each man similar opportunities before him. These chances are talked over at home and it shows in the results at the office.

Having worked out the plan whereby a man's strength and weakness might be pointed out to him and used as a basis of pay and promotion, it was next desirable to get a practicable plan by which he might be helped to develop himself. A foreman's training school was therefore organized, attended by sub-foremen and foremen and a few selected mechanics. Attendance was voluntary, but all foremen and their assistants joined with the exception of one or two. Sessions were held once a week, in the evening. In addition, conferences were arranged between the foreman and service superintendent daily between 9 and 10 a.m., on a pre-arranged schedule,

(Continued on page 33)

The Proper Selection of Grinding Wheels

Two Types of Artificial Abrasives and Four Types of Band Used
—Adaptability of the Two Abrasives—Grinding Action of Wheel
—Variable Factors Incurred—Wheel Speed—Personal Factor

By R. N. JOHNSON*

TWO distinct types of artificial abrasives and four types of bond are used in the manufacture of grinding wheels. There are still a few wheels on the market which are made up of natural abrasives, such as emery and corundum, but these are very much in the minority.

Abrasives

One type of artificial abrasive is made up essentially of crystalline aluminum oxide and is spoken of as aluminous abrasive. The aluminous abrasives may be recognized by such trade names as alundum, aloxite, alowalt, borolon, corowalt, oxaluma, rex, carbo-alumina, corolox and sterlith.

The other type is composed of silicon and carbide and spoken of as silicon carbide. It may be recognized by such trade names as crystolon, carbolite, carbolon, carbowalt, corex, electrolox, gresolite and sterbon. The artificial aluminous abrasives are made by fusing bauxite (a mineral containing a high percentage of aluminum oxide) in an electric furnace.

Silicon carbide is made by heating coke (carbon), silica sand, sawdust and salt together in a resistance type of electric furnace. The carbon of the coke and the silicon of the sand combine chemically, forming the abrasive. This abrasive is screened and is then ready for use.

Adaptability of the Two Abrasives.

The aluminous abrasives are tough and more adapted to grinding all kinds of high tensile strength materials, such as soft steel, hardened and high speed steels and annealed malleable iron. The silicon carbide abrasive is hard and brittle and is most efficient when used for grinding cast iron, brass and other materials of lower tensile strength. Four different types of bond are used, namely, vitrified, silicate, rubber and elastic.

Uses of the Different Bonds.

The silicate bond is used when wheels must be manufactured quickly, where wheels larger than 36-inch are used, and for some surface and tool grinding work. One of the largest fields is that of knife grinding, such as paper knives, pocket knives, wood working knives, etc.

Elastic wheels are used in cases where very thin wheels are required for cutting off stock and where cool cutting and a fairly good finish is desired, such as ball race grinding.

Rubber wheels are usually made of

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harder grades than elastic wheels. They are used where thin wheels are required on rather severe operations on which a thin elastic wheel might break. Some thick rubber wheels are used for snagging, and on rather severe operations where the strength of a vitrified wheel might not be sufficient to assure entire safety.

All other wheels, probably at least 80 per cent. of those manufactured, are made by the vitrified process and used on all kinds of cylindrical, snagging, surface grinding, tool and cutter and internal work.

Grinding Action.

The grinding action of a wheel depends on two factors, namely, the kind and size of abrasive, and the grade of wheel. "Grade" is the term used to denote the hardness of a grinding wheel. It actually represents a measure of the strength of the bond or the cohesive force exercised by the bond to retain the grain in its setting. For each grinding job there is a particular wheel that will give best results, a wheel having a certain size of abrasive grain held together with a bond of certain strength. Grinding action is, of course, dependent on the kind of abrasive used in the wheel.

THINGS TO REMEMBER

Aluminous abrasives are tough and more adapted to grinding all kinds of high tensile strength materials such as soft steel, hardened and high speed steels, and annealed malleable iron.

Silicon Carbide Abrasive is hard and brittle, is most efficient when used for grinding cast iron, brass and other materials of low tensile strength.

Considering the same material—remember that the harder it is, the softer the wheel must be to cut efficiently. The broader the contact of the work to the wheel, the softer the grade should be.

Sharp fins on castings wear ordinary snagging wheels much more rapidly than flat broad surfaces, consequently they should be ground with harder and finer grain wheels.

The type of machine used is important as each type creates certain grinding conditions which must be thoroughly known in order to make the most intelligent wheel selection. Vibration in a machine should never be tolerated if good work is desired.

Several general rules govern the action of grinding wheels. These could be specified as follows:

1. Use aluminous abrasives for high tensile strength materials.

2. Use silicon carbide for low tensile strength materials.

3. Use fairly soft wheels when wheel wear can be sacrificed for production. There is, of course, a limit.

4. Coarse grain wheels usually cut more rapidly than fine ones, and consequently wear faster. There is a limit to the coarseness of grain used in wheels, governed by the material being ground and power required to make each individual grain penetrate into the material ground.

5. Coarse grain wheels will not always produce as fine a finish as fine grain wheels. However, in some kinds of precision work, a very fine finish can be obtained with coarse grain wheels, provided they are properly trued.

6. Fast cutting wheels are usually cool cutting wheels.

The selection of grinding wheels for a given job involves: first, consideration of a set of more or less fixed conditions that the wheel must fit into; and second, careful attention to influential factors capable of modification or change to suit the conditions. These factors might be grouped as follows:

Given Conditions.

1. Material. 2. Shape and dimensions of work. 3. Contact. 4. Type of grinding machine.

Variable Factors.

1. Wheel speed. 2. Work speed. 3. Condition of machine. 4. Personal factor.

Material.

This factor determines the kind of abrasive that should be used. Considering the same kind of material, the harder it is the softer the wheel must be to cut efficiently.

The shape and dimensions of the work, especially in cylindrical grinding, will have some effect on the size, grain and grade of wheel employed. Short, stiff work can often be ground with a wide wheel by feeding straight in, while long, slender work requires that the wheel be traversed, and will call for a somewhat narrow wheel and the use of steady rests.

The broader the contact of the work to the wheel, the softer the grade should be. For instance, a ring wheel employed for surface grinding is usually of a softer grade than that employed for

cylindrical grinding, while a ring wheel employed for internal grinding is still softer than that employed for internal grinding; all on account of the contact between the work and the wheel. Sharp fins on castings wear ordinary snagging wheels much more rapidly than flat, broad surfaces, and consequently they should be ground with harder and finer grain wheels.

Type of Grinding Machine

The kind of machine employed for the various classes of work and size of wheel it mounts is important in making a selection of wheels. For example, a surface grinding machine, which mounts a rather large diameter, broad face wheel, will call for a coarser and softer grade than another type of surface grinding machine which mounts a rather small diameter, narrow face wheel. Still another type of surface grinding machine, which mounts a cup or ring wheel, will present a broader contact to the work and will, therefore require an even coarser wheel than either of the two types mentioned. Each type of machine creates grinding conditions which must be thoroughly known in order to make the most intelligent wheel selection.

Wheel Speed

Past experience has shown that a certain range of wheel speeds gives best results for the various operations. The faster the speed, the harder the wheel will act, and vice versa. The more common recommended wheel speeds are given below:

Kind of Grinding	Peripheral Speed in Feet per Minute
Cylindrical grinding	5500 - 6500
Snagging and general off-hand grinding	5000 - 6000
Surface grinding	4000 - 5000
Knife grinding	3500 - 4000
Wet tool grinders	4000 - 5000
Vertical spindle surface grinding	4000 - 4500
Elastic and rubber cut-off wheels	9000 - 12000

The speed at which the work is revolved in both cylindrical and internal grinding, or the speed at which it is either revolved or traversed back and forth on surface grinding, has a great deal to do with the action of a particular grain and grade of wheel. Space does not permit our covering this subject here. It can only be said that there is no fixed work speed which can be recommended, but rather it must be determined by experiment for each individual operation.

Condition of Machine.

A machine in poor condition is naturally quite hard on a grinding wheel. The greater the vibration of the wheel on the work, the faster it will wear out, and consequently the harder the wheel must be to stand up on the machine which is in a poor condition. Vibration not only wastes the wheel, but tends to ruin the machine, and should be eliminated at all times if grinding is to be carried out most economically and effi-

ciently with a resultant high quality of work.

Personal Factor

The operator is the biggest factor in the success or failure of a grinding wheel or machine. He can waste wheels by being careless in the use of a dresser, by not taking care of the machine he is using, by forcing a wheel beyond its ability to cut, and by operating wheels at incorrect speeds. An intelligent grinding machine operator can usually obtain good results on a grinding operation with a range of grains and grades of wheels, provided he understands how to vary conditions, such as work speed, wheel speed and application of the work to suit the particular wheel in use.

Have you some trouble in the use of your wheels? If so see if any of these remedies will help you out. Suppose the wheel does not cut, try these suggestions:

1. If running too fast, reduce the speed of wheel.
2. Try a softer wheel.
3. Try coarser wheel if finish is not important.
4. Be sure the abrasive is the right kind for the material.

If wheel wears too rapidly, try these:

1. If running too slow increase wheel speed.
2. Try harder wheel.
3. Try finer wheel.
4. Eliminate vibration in machine.
5. Reduce pressure of work on the wheel.

If wheel does not give good finish (precision grinding):

1. Dress the wheel to a perfect cylinder.
2. Put smooth face on the wheel with a diamond.
3. Eliminate vibration of machine spindle.
4. Balance wheel if it is out of balance.
5. Use finer wheel.
6. Use elastic wheel.

For wheel loads: 1. Increase speed if

below that recommended. 2. Try coarser wheel. 3. Try softer wheel.

For wheel glazes: 1. Reduce speed if above that recommended. 2. Try softer wheel. 3. Be sure the correct abrasive is being used.

For wheel burns use the same suggestions as given for wheel not cutting.

If wheel does not hold shape, use suggestions for wheels wearing too rapidly.

PROMOTION MYSTERY

Continued from page 31

and department conferences between foremen and assistants at definite times, which latter conferences the superintendent frequently took occasion to join.

Men meeting together in this way helped iron out the hard and rough places and got to know each other better. The whole scheme is thus closely linked up and everybody knows how it works, and why.

The immediate effects of any such plan

are at first intangible, felt rather than seen. There is a different attitude in the air, more loyalty, finer co-operation. Individuals have been re-made, according to their own words, in this particular plant. One was formerly a test-ter with a continual grouch. Members of other departments hesitated to approach him or ask for his assistance. He was a real bear. The change the plan worked in him has brought him promotion. He is now in charge of new car deliveries, a job which brings him in contact with customers. His manner, disposition and feeling are entirely reversed. The spirit of antagonism between the sales inspection and the shop departments has been knocked on the head. More work is done on time. The sales inspector who may observe something on the car while it is moving which would puzzle or escape the mechanic with the car standing in the shop, takes the trouble to write a suggestion on the other card. Each man knows he can't get ahead by stepping on another man. Team-work is the only thing that can win when a man may be rated any day by the man next to him.

To sum up, this plan of building morale consists of analyzing the individual, making his opportunity plain to him instead of mysterious, training him for the better job ahead, and killing off the occult. It is a plan of human management which can be applied to places where the usual methods of promotion study, bonus and the like are impossible. It is a plan of working for efficiency through the development of men, more than through the development of methods. It has collective bargaining lashed to the mast for fairness and development. And it removes the word discouragement from Bill Green's vocabulary, which is a good word to have removed at a time when more courage, more interest and better work all around are so essential to our national welfare.

FACTORY LIGHTING

During the year 1915 a special committee formed by the British Government issued an interesting report on the lighting of factories and workshops. The subject was dealt with from the standpoints of the safety and health of the operatives and also of the increase of production. Largely as a result of this report the standard of illumination in the British munition factories erected during the war was exceptionally high and there was a marked improvement in the lighting of ordinary factories. The report was in the nature of an interim document, and the inquiry has now been resumed under the guidance of several experts. An investigation will be made into the general conditions necessary to secure suitable lighting in factories and workshops and into the effects of mixed and artificial lighting, with special reference to underground workrooms.

FOR SALE

LONGUEUIL STEEL WORKS

the property of

Armstrong Whitworth of Canada, Ltd.

Location

The plant is situated on the South Shore of the St. Lawrence River opposite the City of Montreal.

Land and Buildings

The land consists of a tract of 180 acres with a 2,200-foot frontage on the St. Lawrence River directly opposite the Harbor of Montreal. The main line of the Q. M. & S. Ry. runs through the property within 100 yards of the main buildings, with a siding into works.

Main Building

1 Story, Steel Frame and Concrete.

Small Tool Dept. 175 x 94
Carpenter & Pattern Shop 40 x 60
Tyre Rolling Mill 275 x 60
Hammer Shop 275 x 60

Annealing and Finishing Dept.
Rolling Mill 275 x 60
Steel Foundry 275 x 94

Open Hearth 91 x 88
Crucible Dept. 100
Repairs and Electrical Dept.

Office Building and Stores

2 Stories, Brick
133 x 41 ea. story.

Laboratory

Metal Lath and Cement
60 x 33

Boiler House

Steel Frame and Concrete
74 x 54

Power House

Steel Frame and Concrete.

Powdered Coal Plant

Steel Frame and Concrete.
64 x 34

Transformer House

Steel Frame and Concrete
52 x 24

Scrap Shed, Brick Sheds, Oil House, Employees' Houses, Pump House, Freight Shed, etc., etc.

Shipping Facilities

The St. Lawrence River frontage has not been improved but could be developed, allowing vessels to use the 30-foot deep channel running from Montreal to the sea.

The property is served with a siding from the Quebec, Montreal & Southern Ry., with spur tracks to all parts of buildings.

Power Plant

The Power Plant consists of two 500 h.p. B. & W. Boilers; two 500 h.p. Goldie & McCulloch Boilers; two 250 h.p. Goldie & McCulloch Boilers equipped with Foster Superheaters; one Canadian Ingersoll-Rand Air Compressor, free air capacity 732 cu. ft. per minute; one Swedish General Electric Steam Driven Generator, 375 K.W.; two Bruce Peebles Motor Generator Sets, 350 K.W. each; three Transformers, 300 K.V.A., 22,500/2,200 V.; six Transformers 140 K.W. 22,500/2,200 V.

This plant is well situated for serving domestic requirements and also for export. There is a plentiful supply of skilled and unskilled labor. The Locomotive Tire Rolling Mill is the only plant rolling tires in Canada.

ARMSTRONG
of Canada,
298 St. James St.,

PARTIAL LIST OF EQUIPMENT

TOOL DEPARTMENT

- 8—Racine Hack Saws.
- 4—Ed. Herbert Hack Saws.
- 2—16" L. & S. Lathes.
- 2—16" Reed Prentice Lathes.
- 1—20" Reed Prentice Lathe.
- 3—14" C.M.C. Lathes.
- 1—Bench Lathe.
- 1—¾" Cleveland A.S. Machine.
- 1—1¼" Cleveland A.S. Machine.
- 1—1¼" Gridley A.S. Machine.
- 2—2" Cleveland A.S. Machines.
- 1—2¼" Gridley A.S. Machine.
- 1—4¼" Gridley A.S. Machine.
- 1—No. 2 B. B. & S. Plain Miller.
- 1—Reinecker Plain Miller.
- 2—No. 6 Whitney Hand Millers.
- 5—Cincinnati Plain Millers.
- 1—Hendey Centering Machine.
- 2—Wells Centering Machines.
- 1—Alfred Herbert Drill.
- 1—Avery Drill Press.
- 2—Greenard Arbor Presses.
- 1—Bertram Drill Press.
- 1—¼" to ½" Holroyd Fluting Machine.
- 1—½" to 1" Holroyd Fluting Machine.
- 1—1½" to 2" Holroyd Fluting Machine.
- 1—3¼" Warner & Swasey Turret Lathe No. 2 A.
- 1—P.&W. Duplex Spindle Profiler No. 11
- 1—No. 2 American Tool Oil Separator.
- 1—Hoefer Tap Threading Machine.
- 1—Noble & Westbrooke Stamping Machine.
- 1—Taylor & Hobson Etching Machine.
- 1—Holroyd Universal Relieving Lathe.
- 1—No. 2A Reinecker Universal Relieving Lathe.
- 1—Flather Relieving Lathe.
- 4—A.W. Relieving Lathes.
- 1—Sand Blast, Hardening and Tempering Furnaces.
- 1—No. 3 Walker Double Stroke Surface Grinder.
- 1—10" Walker Single Stroke Surface Grinder.
- 1—No. 1½ Cincinnati Universal Grinder
- 1—Norton Plain Grinder, 10" x 50".
- 2—No. 3 B. & S. Cutter Grinders.
- 3—No. 1½ Cincinnati Universal Cutter Grinders.
- 1—Wells Grinder.
- 3—No. 2 B. & S. Cutter Grinders.
- 1—8" Walker Surface Grinders.
- 2—No. 11 B. & S. Plain Grinders.
- 2—No. 10 B. & S. Plain Grinders.
- 1—No. 3 B. & S. Universal Grinder.
- 1—No. 13 B. & S. Surface Grinder.
- 2—No. 70 Heald Boring Grinders.
- 1—No. 3 Rivet Boring Grinder.
- 1—10" x 20" Landis Grinder.
- 1—12" x 42" Landis Plain Grinder.
- Etc., etc.

CARPENTER AND PATTERN SHOP.

- 1—Band Saw.
- 1—Circular Saw.
- 1—Aluminium Stamping Machine.
- 1—Wood Lathe.
- 1—Small Drill.
- Etc., etc.

TYRE ROLLING MILL

- 1—Morgan Eng. Tyre Rolling Mill.
- 1—Morgan Eng. Tyre Rolling Mill.
- 1—C.C. Twin, Rolling Mill Engine, 1,000 H.P.
- 1—Tyre Centering Press.
- 1—Tyre Stamping Press.
- 1—2,000-ton Press.
- 1—1,000-ton Press.
- 1—600-ton Press.
- 1—Hydraulic Accumulator.
- 2—Tyre Charging Machines.
- 1—5-ton Whiting Crane.
- 1—Continuous Furnace.
- 3—Reheating Furnaces.
- Etc., etc.

HAMMER SHOP

- 1—5-ton Whiting Crane.
- 1—500-ton Forging Press.
- 1—3-ton Bertram Steam Hammer.
- 1—1-ton Massey Steam Hammer.
- 1—12 cwt. Massey Steam Hammer.
- 1—8 cwt. Massey Steam Hammer.
- 1—4 cwt. Massey Steam Hammer.
- Reheating Furnaces.
- Etc., etc.

ROLLING MILL

- 1—Brightside Roll Turning Lathe.
- 1—9" Boonton Rolling Mill.
- 1—12" Lamberton Rolling Mill.
- 1—Porter Allen Steam Engine, 350 H.P.
- 1—Todd Steam Engine, 1,000 H.P.
- 1—5-ton Whiting Crane.
- 3—Reheating Furnaces.
- Etc., etc.

STEEL FOUNDRY

- 1—15-ton Whiting Crane.
- 1—15-ton Wellman Seaver & Head Crane.
- 3—6-ton Heroult Electric Furnaces.
- 1—3-ton Heroult Electric Furnace.
- 1—5-ton Ladle.
- 6—10-ton Ladles.
- 1—Ladle Heater.
- 1—Coke Grinder.
- 1—7 ft. Wet Pan.
- Swing Grinders, etc., etc.

OPEN HEARTH

- 2—18-ton O.H. Furnaces.
- 1—Charging Machine.
- 1—Track Scale, 15 Tons.
- 1—25-ton Crane.
- 40—Charging Boxes.
- 20—Charging Box Trucks.
- 4—20-ton Ladles.
- Etc., etc.

CRUCIBLE DEPARTMENT.

- 1—Crucible Furnace.
- 1—Pot Annealing Furnace.
- 1—Pot Molding Machine.
- Etc., etc.

REPAIR DEPARTMENT

- 1—Radial Drill.
- 1—Planer 42" x 36" x 14' 0".
- 1—24" Gap Lathe.
- 1—24" Lathe.
- 1—Threading Machine.
- 1—26" Vertical Drill.
- 1—16" Lathe.
- Etc., etc.

OFFICE BUILDING

Complete office equipment with fire-proof vaults for Superintendent's Office, Accounting Department, Engineer's Office, Timekeeper's Office, first aid, complete restaurant equipment. Storehouse, necessary bins. Warehouse, necessary racks, etc., etc.

POWER HOUSE

- 1—Swedish General Electric Steam-driven Generator, 375 K.W.
- 2—Bruce Peebles Motor Generator Sets, 350 K.W. each.
- 1—Switchboard, 11 panels.
- 1—Overhead Crane, 10 Tons.
- Etc., etc.

LABORATORY

Chemical and Physical. Scales, Instruments, complete. Tensile and Bending Testing Machine. Micro-Photographic Instrument. Brinell Testing Machine for hardness

POWDERED COAL PLANT

- 1—Powdered Coal Plant, complete. Capacity, 5 tons per hour. Holbeck System.

BOILER HOUSE

- 2—500 H.P. B. & W. Boilers.
- 2—500 H.P. G. & McC. Boilers.
- 1—2,000 H.P. Cochran Feed Water Heat
- 1—Weir Feed Pump
- 1—Vacuum Pump.
- Etc., etc.

TRANSFORMER HOUSE

- Lightning Arresters.
- Oil Brake Switches.
- Current Transformers for overload relay.
- Single Pole Disconnecting Switches.
- 3—200 K.V.A. Transformers, 22500/2200 V.
- 6—140 K.W. Transformers, 22500/2200 V.
- Etc., etc.

YARD

- 1—Yard Locomotive, 4-wheel saddle tank
- 1—15-ton Brownhoist.
- 1—Track Scale, 100 tons.
- 1—Flat Car.
- 1—Dump Car.
- 3—Oil Storage Tanks (underground). Oil Pumps.
- 1—Lime Kiln.
- Etc., etc.

PUMP HOUSE

- 2—Allis-Chalmers Electrically-driven Hydraulic Pumps, capacity 550 gals. per minute.

WHITWORTH
Limited
 Montreal
 Canada



WHAT OUR READERS THINK AND DO



TURNING IRREGULAR FORMS

By J. DAVIES

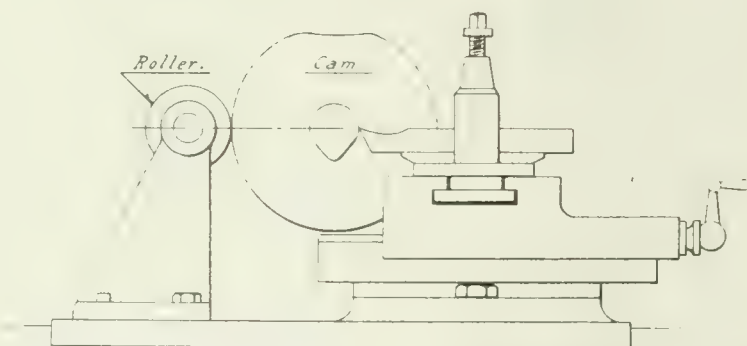
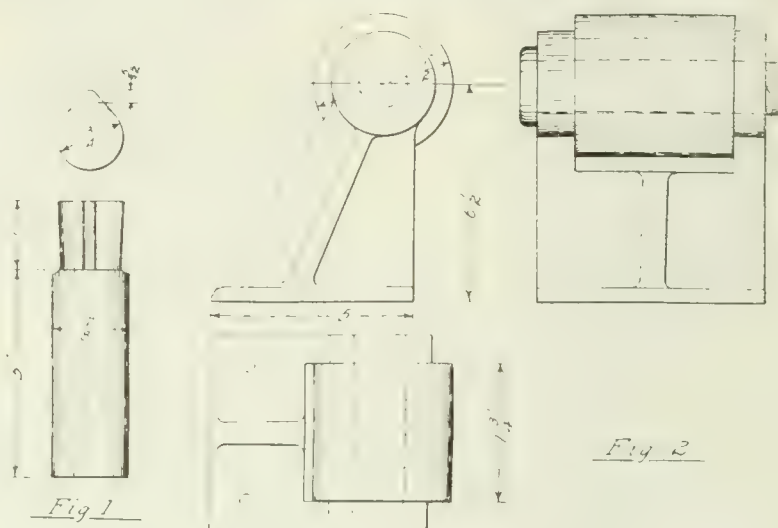
WE recently had a considerable number of punches to be made to the form shown in Fig. 1. These were to be used in punching chain links. At the first attempt we rough turned one, leaving enough stock on to get the shape. Then we marked off the profile on the end, milled as near as we could to the lines, and filed the rest. This process was altogether too slow, so we did a little experimenting on the lathe with entirely satisfactory results. I do not pretend to know the exact theoretical method of developing cams, so will give an account of our experiments, and should any reader have any correction or improvement we shall be glad to hear from them.

First, we secured a casting from the scrap heap and machined it to dimensions given in Fig. 2. We next turned a concentric roller to suit, then fitted the bracket on the back of the cross slide of lathe so that the centre of the roller was the exact height of the centre of the lathe. We then bored a piece of cast steel 4 inches in diameter and $1\frac{1}{4}$ inches wide a close push fit for the body of the punches to be turned. This piece of steel was to be used for a cam, and could have been any convenient diameter, but it was thought that the larger the diameter the easier the action, as the amount of throw remained constant irrespective of the size of the cam.

The next step was to lay out a cam that would produce the desired shape. This was done as shown in Fig. 3. The basic principle adopted in the laying out of the cam was the fact that as the

roller was constantly pressed against the cam, and the bracket carrying the roller and tool post carrying the tool were both attached to the same slide, the distance between the tool and the

roller would always be the same when measured in a straight line through the centre of roller centre of cam, to the cutting edge of the tool. When I say this distance was constant, I mean it



SHOWING STYLE OF CASTING USED AND METHOD OF CUTTING THE FORM.

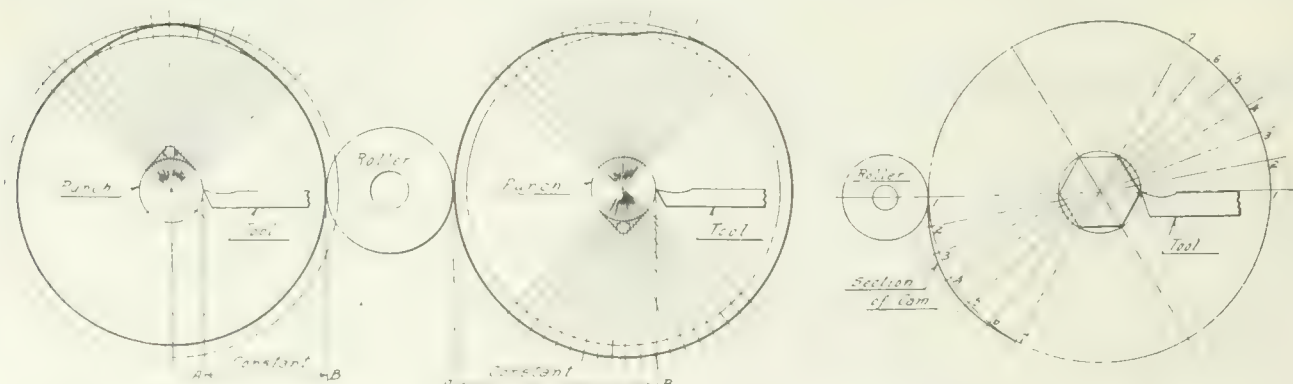


FIG. 3—THE METHOD OF LAYING OUT THE CAMS. SKETCH SHOWING AUTHOR'S IDEA OF HEXAGON CAM.

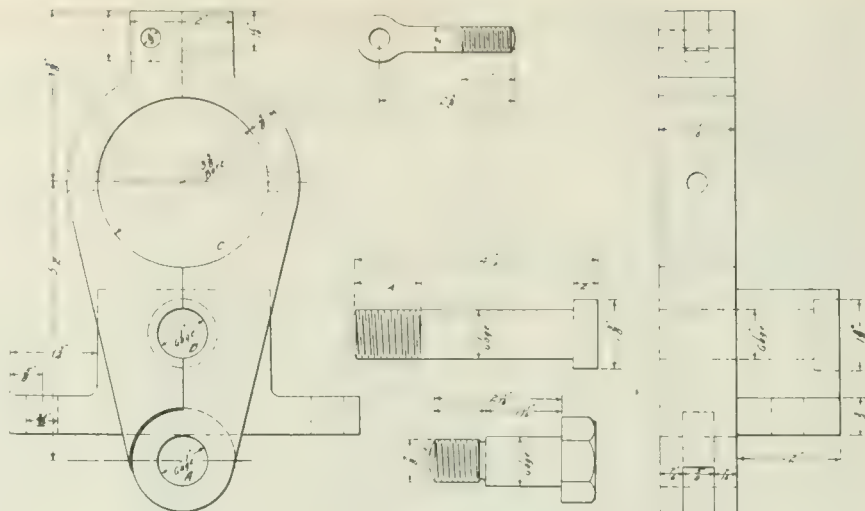
was constant during the same cut. The feed was put on by using the compound. This shortened the distance at every cut and produced a different shaped punch. So it remained for us to develop our cam to produce the right shape, and of the right size. This we did by marking off as shown in sketch, taking the distance from roller to tool as a constant when the tool was on the finishing cut, and marking off a number of lines through the centre of roller and cam to the cutting edge of tool. The number of lines is immaterial. The more lines, the more points in the curve, and consequently greater accuracy.

We next removed the transverse feed screw and inserted a strong spiral spring in its place at the back of the slide to keep the cam up to the work. The cam was fastened to the punch, being turned by a $\frac{1}{2}$ -inch bristo safety screw sunk below the surface, leaving enough stock sticking out through the end of cam to form the punch. This gave us an entirely satisfactory job, the punches being finished perfectly to form and size. I venture to say that by this method any irregular form can be accurately turned practically as quickly as turning an ordinary round bar. This rig would be no use to produce a single piece, but for repetition work I think it will prove very useful. We took the precaution to put taper dowel pins in the bracket at the back so that the whole attachment could be replaced on the lathe in about five minutes. We have not yet tried to turn an hexagon, but I believe it could be done and I have shown a sketch of the cam required for such work.

BORING FIXTURE

By Cecil H. Smith

In the manufacture of a certain class of pump, it is essential that the shaft sleeves for the main shaft be very accurately bored. These sleeves vary in diameter, the smallest being $1\frac{7}{16}$ inches outside diameter, while the largest is 4 inches. They range in length from $4\frac{1}{2}$ inches to $17\frac{1}{2}$ inches, so it will readily be seen that it was quite a task to de-



GENERAL VIEW AND DETAILS OF THE CLAMP USED.

sign one fixture to handle all sizes. The result is shown at Figs. 1 and 2.

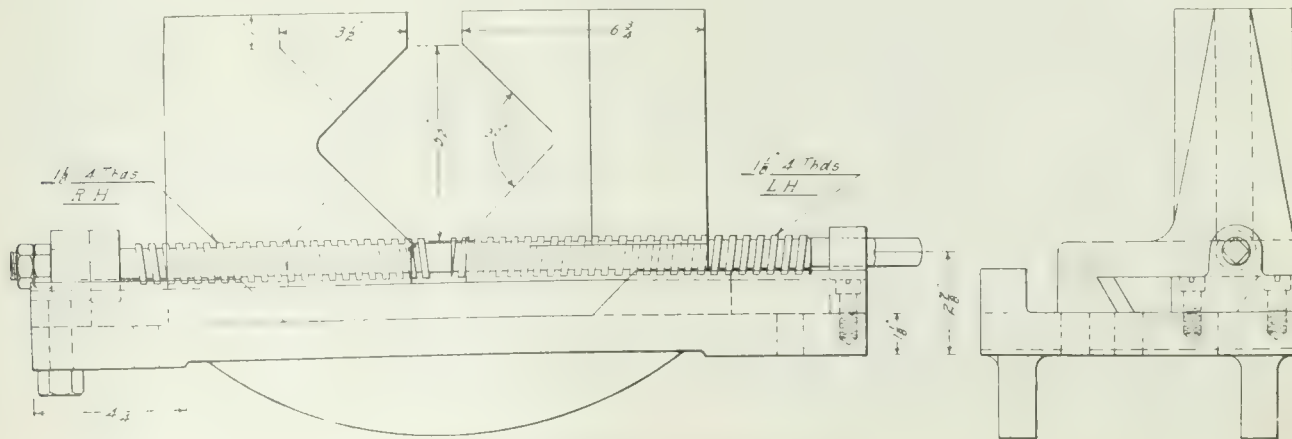
An ordinary lathe was used, the regular tool slide being dismantled, the two vises, as shown at Fig. 1, being fastened through the medium of the regular Tee head bolts to the saddle. On the shorter brasses we used only one vise, taking off the second vise until the shorter sleeves were completed. Next let us glance at Fig. 2.

This view shows the boring bar guide, two of these being used, one at each end of the fixture. It is readily understood that these guides had to swing out of the way while inserting a new sleeve and placing the boring bar, so provision was made for so doing. The guide swings open from the pivot point A and cannot close further than the gauge point B. This pin centres the two halves of the guide, and guarantees that the boring bar is properly supported. The eye bolt at top holds the complete guide together.

A bar having a double fly cutter is used, and the bar itself is supported by a separate socket which is screwed to the spindle of machine. A standard taper hole in this socket allows all bars to fit the same socket. In some cases, the end of the boring bar is built up by intermediate drill sockets until they fit

the socket on the lathe spindle. Three cuts are usually taken, a roughing, semi-finishing and finishing cut, and as these sleeves are made from high quality brass an excellent finish is secured. Since adopting the fixture production time has greatly improved, and we have no inaccuracy, the holes being perfectly round. Chatter is also eliminated, so that I can pass the idea along with perfect confidence.

A survey of the oil districts of California has been made by the United States Bureau of Mines in order to ascertain whether the visible masses of wasted oil-bearing sands would be a profitable source of supply. From the data collected, it is estimated that 2,359,100 barrels of oil, valued at more than \$3,500,000, could be obtained from the sand piles about producing wells, and from the outcroppings in the vicinity of the fields. Also, many times that amount of oil scattered over nearly the total oil-producing area might be recovered from seepage—that is, the oil permitted to soak into the ground or spread over the surface. The character of these wastes and possible methods of recovery are given in a recent report issued by the bureau.

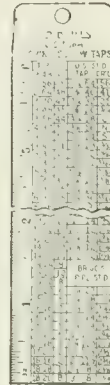


SIDE VIEW SHOWING ONE VISE ONLY.

Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.

To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Several contestants had eleven out of the twelve questions correct, but only one reader, J. A. Scarborough, 307 Poplar Ave., Winnipeg, Man., submitted a correct list. A scale goes forward to him at once. Who will be the next?

CONTEST FOR MAY 12TH ISSUE

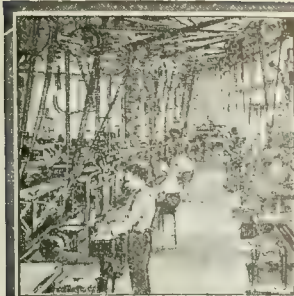
Contestants are required to write us, stating to which advertisements we refer in this number.

- 1—Something that requires no special vises or fixtures.
- 2—A product said to be always accurate and dependable.
- 3 A product that has been turned out in thousands during the past 11 years.
- 4—How to solve a certain kind of problem.
- 5 A case where you are requested "Not to Wait."
- 6—Something that is a special feature. It is made in Canada.
- 7 A product that is made in one grade only.
- 8 What to do if you come from Missouri.
- 9—A product said to be long-lasting under hardest use.
- 10 A new discovery that works very quickly.
- 11 Something that has seven features.
- 12 How to get accurate production.

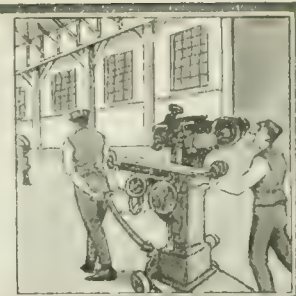
These are Correct Answers for List from April 21st Issue:

- 1—Geometric Tool Co.
- 2—Diamond State Fibre Co.
- 3—Shepard Electric Crane & Hoist Co.
- 4—Hamilton Gear & Machine Co.
- 5—Aikenhead Hardware, Ltd.
- 6—H. W. Petrie, Ltd.
- 7—Canadian Link-Belt Co., Ltd.
- 8—Canadian Hart Products Co.
- 9—Ingersoll Machine & Tool Co.
- 10—J. C. McLaren Belting Co.
- 11—The Torrington Co.
- 12—The Toledo Machine & Tool Co.

Closing Date for This Contest is June 2nd



DEVELOPMENTS IN SHOP EQUIPMENT



VARIOUS LINES

The Selson Engineering Co., Ltd., 85 Queen Victoria Street, London, England, have given us some interesting information regarding three of their lines. At Fig. 1 is shown their 13-inch swing, vee bed, gap lathe. This machine has a bed of strong section, and the headstock has steel reverse gears. The spindle is of .5 carbon steel, large diameter, and is accurately ground to size. The gear box has three changes of feed and the gears are totally enclosed.

The apron including most of the bearings is cast in one piece and carries self-acting, sliding, surfacing and screw cutting mechanism. The standard equipment can be varied by the omission of the tray, the substitution of an American type tool post instead of the four-tool turret tool post, and also of a quick change gear box for the semi-quick box. The lead screw can be made metric if required or 127-tooth change wheel added as an extra.

Heavy Cut Shaper

The shaper shown at Fig. 2 is capable of running at high speed and taking heavy cuts. The ram adjustment is secured by a hand wheel, rack and pinion, while a locking lever is placed directly under the wheel as shown. An index for the stroke is provided, and the stroke adjustments can be effected at rest or in running condition.

The feed motion is of original patented design and the moving parts of the feed mechanism are brought to rest by depressing a hand lever when the machine is running at any speed, thus allowing the feed to be altered or reversed in perfect safety without stopping the machine. Single pulley, cone pulley or motor drive can be used on this machine.

This concern also produce a patented central-thrust high speed radial drilling machine which contains some very interesting points in design. The carriage of these drills is gibbed to the front and underside of the arm. The front plate carries the top bearing of spindle, driving gears and feed mechanism, while the under plate forms the lower bearing and takes the central thrust of the drill.

On the six-foot machine a fine radial adjustment is placed on the carriage and the operator can control all motions for setting the drill without leaving his working position. Other parts are likewise well designed, but for lack of space we cannot enter into further detail.

INTERESTING TOOL HOLDER

A special tool and holder, known as the "Twisto," that has several points of interest is now offered to the trade by John H. Hontstream, of Hartford, Conn. The cutting tool, which is held in a special holder, is in the form of a short length

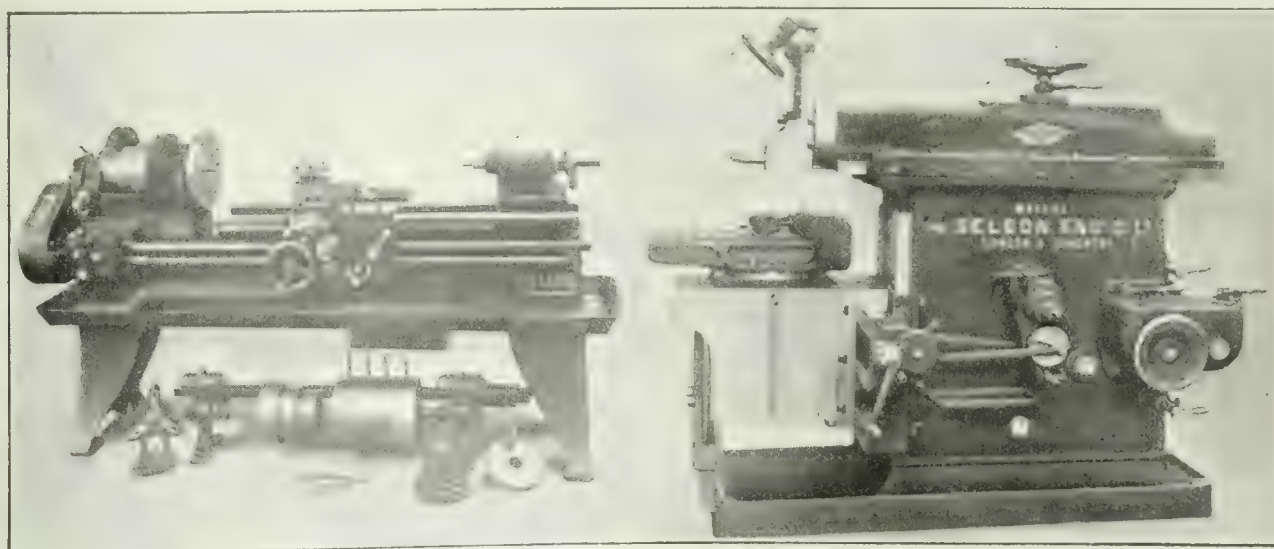
of steel with helical grooves, similar to a twist drill. It is thus provided with six separate cutting edges. The bits are furnished in 2-inch lengths and it is claimed that each bit will provide 6¾ inches of cutting length. When sharpening only the ends are ground. A special holder is used for clamping the tool bits and it may be adapted for the holding of the shanks of forming cutters.

OPEN-SIDE CRANK PLANER

The Automatic Machine Co., of Bridgeport, Conn., have placed on the market a new model of their open-side planer especially adapted for tool-room work. The machine is equipped with a combination clutch and brake mechanism, which provides for instantaneous starting or stopping of the table without changing the direction of rotation of the motor or countershaft. When starting the machine the brake is released immediately the clutch is engaged and vice-versa. Drive is transmitted from the friction pulley through sliding gears to the bull wheel and crank that drive the table. Driving shafts are fitted with ball bearings. Quick return stroke is provided for the table.

PRESSED-STEEL PLATFORMS.

Pressed-steel platforms for use with elevating trucks are now being made by the Powell Pressed Steel Company of Hubbard, Ohio. These platforms may



GENERAL VIEW OF A 13" LATHE, ALSO A HEAVY CUT SHAPER PRODUCED BY THE SELSON CO.

be of any desired size, limited only by the size of sheet obtainable. The strengthening ribs are placed six inches apart and are $\frac{3}{4}$ inch by $1\frac{1}{2}$ inches. The clearance space ranges from $6\frac{1}{2}$ to 12 inches. The platforms may be made of any desired material, but the usual practice is to use 7, 9, 10 or 12 gauge stock. A platform made of No. 9 gauge steel will carry a load of about six tons. Containers of any special shape or size may be spot-welded to the top of the platform.

NEW DRILL CHUCK

The Jacobs Manufacturing Co. has placed a new drill chuck on the market, this to be known as the "Jacobs' Super" chuck. This is a specially patented chuck and the body is made of a steel of special process, deeply case hardened. Through a special process in the heat treating, the taper hole is left soft, fitting it for use on a hardened and ground arbor. This taper hole is ground to give perfect accuracy. A hole is drilled and tapped through the centre of the body and fitted with a threaded plug which may be easily removed with a screw-driver if it is desired to insert rods or other material through the chuck. The taper holes on the chucks are of the same dimensions as those of the previous design. Through careful design the weight of the new chuck has not been increased. Each of these chucks has been designed to meet the changed drilling methods of the last few years with relation to design, weight and capacity. All needless weight has been eliminated.

Ball bearings inserted between the nut and the body reduce friction to a minimum, making it possible to redesign the thread on the nut and the jaws with a coarser pitch. Reduction of friction makes it possible to tighten the chuck with greater ease than formerly, preventing undue wear on the keys, sleeves and other parts of the chuck, at the same time giving greater gripping qualities. An oil hole inserted in the back end of the chuck makes it possible to lubricate all of the working parts.

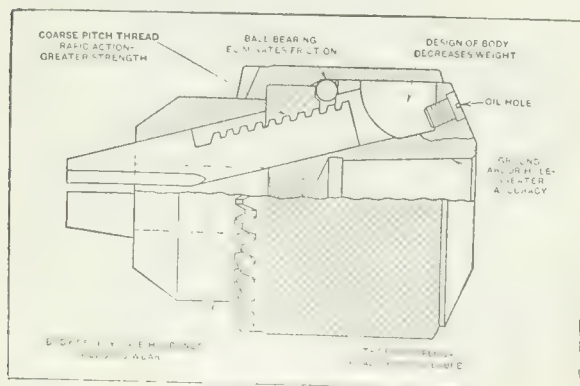
According to this company actual

tests have proved that this new chuck has shown that one-half the pressure on the key in tightening the chuck will produce the same results as in chucks of the previous design. The change in pitch of the thread on the jaws has resulted in reducing by one-half the number of turns of the sleeve to tighten or loosen the chuck.

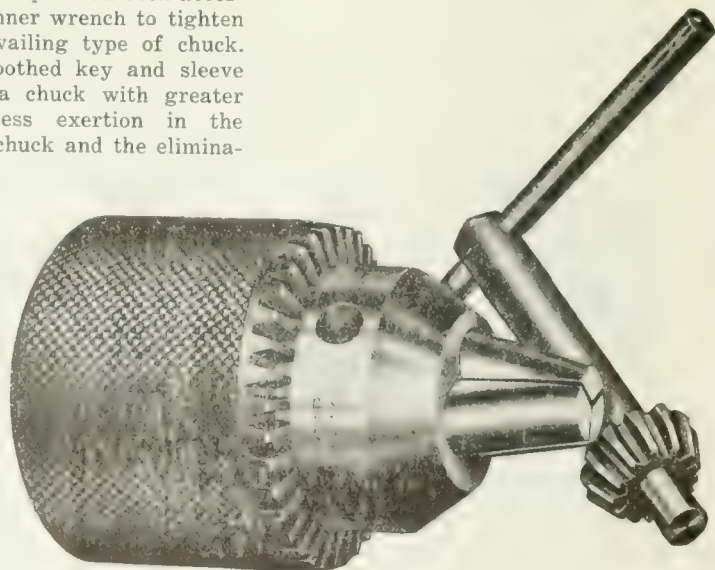
The Jacobs improved drill chuck was patented and invented in 1902. It is claimed that it was the first chuck of the toothed key and sleeve type. Previous to the invention of the chuck of the toothed sleeve and key it had been necessary to use a spanner wrench to tighten or loosen the prevailing type of chuck. The use of the toothed key and sleeve type resulted in a chuck with greater holding power, less exertion in the tightening of the chuck and the elimina-

tion of the holding of the spindle against rotation.

The new "Super" chuck was invented and patented in 1909, and later patents were issued in 1915. This new chuck in outward appearance is very similar to the old one. Its outward design has been changed slightly to give it better proportions. A number of these new chucks have been in actual service for a period of six years, during which time they have proven beyond a doubt their efficiency. They have been subjected to every conceivable test for accuracy, ease of operation and durability.



SECTIONAL VIEW OF THE CHUCK.



GENERAL VIEW OF THE CHUCK.

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CANADIAN MACHINERY

AND MANUFACTURING NEWS

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Our Buying and Selling

FOR the twelve months ending March, 1921, Canada bought from United States goods to the value of \$856,613,430. In the same period she sold to United States goods valued at \$542,304,456.

In that year she bought from the United Kingdom \$213,910,988 worth and sold to that country \$312,842,921 worth of goods.

In our exports four lines stand out prominently: (1) vegetable products; (2) wood, wood products and paper; (3) animal products, while iron and its products come fourth, although a long way below the other three classes.

In imports, vegetable products lead as they do in exports. Then comes iron and its products. It is worthy of note here that United States still dominates this market, sending in here shipments valued at \$226,862,456, against \$16,698,085 from the United Kingdom. Both countries used to have about an equal share of this business, but in 1920 it stood 16 to 226 in favor of United States.

The fourth largest item in imports was fibres and textile products, where Britain, as might be expected, has a lead, but not so large as might be expected, considering the advantage of the preferential tariff.

In the period mentioned, Canada imported goods valued at \$1,240,125,056 and exported goods valued at \$1,189,163,701.

Where German Goods Go

THE German statistical office has been sending out some interesting figures, showing where its goods are going. The comparisons shown here are for the purpose of giving the destination of German-made goods for 1920 against 1913. The figures show percentages in each case:

Country—	1920	1913
Holland	21.2	6.9
Switzerland	9.2	5.3
Sweden	7.1	2.2
Norway	3.0	1.6
Denmark	6.1	2.8
Finland	1.7	1.0
Spain	2.5	1.4
Austria-Hungary	7.8	10.9
Balkans and Turkey	1.1	3.1
Russia and Poland	2.5	8.7
Great Britain	6.4	14.3
France	3.0	7.8
Belgium	3.1	5.4
Italy	3.0	3.9
Other European Countries	5.1	.6
United States	7.2	7.1
Other Extra European Countries	10.1	16.9

Hard to Hold Men's Confidence

IT is nothing new to have a manufacturer state that one of his hardest problems now is to get and hold the confidence of his men.

Several of them have stated almost this same fact to this paper. One manufacturer, speaking of this matter, said: "When a deputation comes in here from the shop now to talk to me one of the things that hurts me most is the sensation, openly and plainly conveyed to me at times, that they do not believe what I am saying about the condition of my business."

There is a very pressing need for a common ground to be established where employers and employees can meet in the fullest confidence.

This is not common to the steel or iron working industries, but employers in other lines will tell you the same thing, viz., they feel that they are not as close to the workshop as they used to be.

There are cases where access to the books of the company is demanded before the men are prepared to accept the claims put forward by employers.

Other firms are finding a way out, but they are finding the same difficulty stated above.

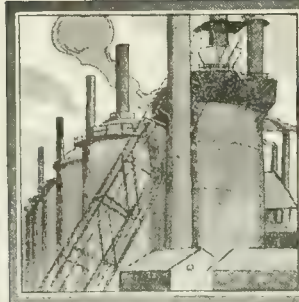
The problem is simply one of making living costs and wage costs come down step for step, and it is a bigger problem than this country has yet successfully solved.

The U.S. Steel Corporation Cuts Wages

THE United States Steel Corporation has cut its wages 20 per cent., making the second reduction in wages since 1904. In the intervening time there have been numerous increases, sufficient to bring the 1920 average wage to \$6.96 per day, as against \$2.68 in 1912. The 20 per cent. reduction will leave the average daily rate of the Corporation \$5.57.

The steel market is inclined to be critical of the manner in which the Corporation has made the move. A month or so ago its selling prices were cut and the market had reason to believe prices would stay on that basis for some time. Now comes the cut in wages and immediately buyers ask "Will there be further cuts in the price of steel?"

It looks as though there were ground for the belief that it would have been better to make both cuts together, selling prices and labor costs. Had this been done the market would have been spared the chance to start asking questions again about probable declines.



MARKET DEVELOPMENTS



Steel Mill Average 31 per cent This Week

Reduction of Wages Causes Some Questioning in the Market—
Price Cutting Still Bothering the Markets in Toronto—Fair Orders
Have Been Secured by Machine Tool Dealers in This District

DULLNESS is the outstanding characteristic of the trade in steel, iron and machine tools this week, but in spite of it some firms report receiving very fair orders, while a number of others have prospects that look certain for real business in a short time. Prices in a number of special lines are being cut to some extent, while firms that find themselves with too much stock in certain lines of small tools are making the prices attractive enough to move them.

Price-cutting in the steel market of Toronto is also a well-established fact and just now most of it seems to centre around the bar mill material. Some of this is due to the fact that dealers find that they still have too great stocks of certain lines and are anxious to keep on liquidating. Then buyers are well aware of the anxiety to do business and they are

doubtless taking full advantage of it being very much a buyers' market yet. There is a certain amount of questioning in the steel market as to whether there will be an adjustment of prices to follow the cut in wages of the Steel Corporation employees of 20 per cent. These questioners forget that the price of steel was cut before the rate of wages. The Steel Corporation is, at the reduced wage, paying an average of \$5.57 per day, against \$2.56 in 1912.

There have been a few bright spots in the scrap metal market in United States, but they were short lived and the general tendency of the trade all over the continent is dull with little volume of business moving. Prices quoted, the dealers claim, are purely nominal, and if they find occasion to buy, they will pay the amount. If not, they are simply out of the market entirely.

SOME MONTREAL FIRMS SEEM TO BE GETTING SOME VERY FAIR ORDERS

Special to CANADIAN MACHINERY.

MONTREAL, May 12.—Industrial conditions in this district have not developed an active strain of late, as a summary of various reports exemplifies the pronounced quietness that prevails in all quarters. Railroad shops are operating spasmodically—on for a few weeks and off for a week. The curtailment of shipbuilding operations at the Canadian Vickers has added to the depression in marine circles. Despite this, however, reports of some dealers in mechanical equipment indicate a slight increase in orders received. Generally speaking, it seems that dullness is still the ruling factor.

Steel Prices May Decline Further

Apart from the expectation on the part of some dealers that steel prices may be subjected to a further reduction before many weeks have passed, the situation differs little from that of other weeks this year, where the outstanding feature has been expressed in the term, "Little doing." A factor which may have an early influence on the market is the fact that American steel producers are facing the possibility of competition

with European manufacturers of steel. Commenting on this phase of the situation one dealer here stated: "It is possible now to secure steel products laid down in Canada from Belgian mills at 50 cents a ton less than it would cost to obtain the same from United States producers. This is a condition that must be considered, and with this prospect facing the trade it is not anticipating too much to expect lower quotations in the near future."

The labor situation has become less acute and this will doubtless assist business operations, provided construction can be started on a greater scale. "Many mills in the States," said a dealer, "are only working a couple of days a week. The practice is to shut down until sufficient orders are in to run the mills for a few days, and when the steel has been made, the plant is again closed for a week or two."

A manufacturer of wire rope stated that they had received an inquiry for a substantial supply of rope, but that owing to it being for a size beyond their capacity they had to pass it up. This firm, however, has reported some good

business during recent weeks. A condition that will eventually aid in the quick return to normal activity when business operations are again accelerated is the depleted state of many factories. While speaking to a master mechanic of a plant here last week the writer was given a little insight into shop conditions. A workman came up and requested several incandescent globes and was instructed to secure them from other parts of the shop. Another request was for a dozen shovels, but after considerable discussion the requisition was reduced to six. "This," explained the m. m., "has been the policy for several months. We are not buying anything but what is absolutely essential; giving to one department at the expense of another. When business comes back to normal we certainly will have a lot of buying to do."

Non-Ferrous Lines Improve

With very few exceptions the old material situation continues to reflect the dullness that has dominated the market for many weeks past. The only variation from previous solitude is the slight activity reported in non-ferrous scraps and it is only by turning the good ear in the right direction that the ring of business can be heard. The small increased movement is almost entirely confined to the copper lines and dealers

here do not think the demand will last. Lead is the only metal showing strength, it having advanced $\frac{1}{4}$ cent to $3\frac{3}{4}$ cents per lb. New brass cuttings are quoted one cent off at 6 cents per lb. Medium brass shows a similar decline at $4\frac{1}{2}$ cents per lb. Red brass turnings at $7\frac{1}{4}$ cents is $\frac{1}{4}$ cent easier. Little demand is reported on steel lines and weakness in quotations is developing. Wrought iron axles are down to \$20 per ton, car wheels \$22 per ton, and stove plate \$17, the decline of the latter two being \$3 per ton.

TORONTO MARKETS HAVE FEW SALES

Price Cutting Has Been Going On in Steel Market—The U.S. Corp. New Wage Scale

TORONTO.—Several aggressive dealers are taking considerable satisfaction out of the fact that they have been able to do a lot of service and missionary work during the past months, and they seem to be quite certain that the time is not far distant when they are going to realize on these efforts.

There have been some orders placed during the week, and although the business was not very large, it was new equipment all through. Dealers still find it very necessary to make certain of the financial standing of customers, as several cases have been reported during recent weeks of surprises that have been sprung on some of the houses.

"We have done a lot of work in the last six months," remarked one dealer this week, "and were it to be judged by the returns we have received so far it must be reckoned as a rank failure, but we are satisfied that judged by results a few months from now it will be called a complete success." This same dealer claims that it is a good stroke of business to keep in touch with the users of your equipment after it is put in operation. Several times he has found machines that, from lack of tooling or special equipment, were not producing anything like capacity. This has been drawn to the attention of the purchaser of the machine, and recommendations made along certain lines. The result has been that the machine does exactly what is claimed for it, whereas were it left alone it might drop back to the pace that some of the operators might set for it.

Right After Business

One of the paper companies in Northern Ontario was receiving tenders for a number of conveyor systems during the past week, and seven firms were represented in going over the figures. Bidding was brisk, as the business was large enough to be desirable.

In other lines the same thing is experienced by the salesmen. Where there is chance of anything being placed, the

POINTS IN WEEK'S MARKETING NOTES

Pittsburgh reports that the total operations of the Corporation and independent steel mills average 31 per cent. of capacity this week.

Furnace men estimate that in the majority of districts consumption of pig iron is equal to the rate of production.

U.S. Steel Corporation cuts wages 20 per cent. and market asks if this means cheaper steel. Prices were cut about a month ago.

Some salesmen from Philadelphia steel mills were in this district looking for orders, being under the impression that business was fairly good here.

Steel merchants in Toronto claim the market is being cut all the time in order to secure orders. Bar mill material is just now the center where most of the cutting is taking place.

This should be the season of the year when reinforcing material would be in demand, but warehouses report sales as being very small and confined mostly to government contracts.

Scrap market has had a few flashes in U. S. points, but they died quickly. Values are unchanged in Canada. Sellers are not taking on much and holders, if they are able, prefer to hang on for better prices.

Machine tool market remains spotty. A few very fair orders have been secured during the week.

buyer has a number of very good options before placing the business.

Cutting in Steel

Toronto steel warehouse men will tell you very plainly that the local market is about as ragged as could be imagined. Prices are being cut and the cuts made are fairly deep at times. The price pruning seems to centre around bars more than any other line, and although efforts have been made at various times to bring the market to something more like a standard, efforts have failed. Some of the merchants have stocks on hand yet that they are anxious to dispose of, and the only way just now is by making the price do the moving. As long as liquidation is being indulged in quite freely the chances of making anything like a uniform market seem quite remote.

Selling has been going on in small

lots, and the orders placed are for much smaller amounts than usual. It all tends to make business more expensive to conduct, as it takes more office work and more trips in delivery.

Representatives of Philadelphia mills are in this district looking for business. One of the salesmen stated that he understood from some reports he had seen that buying in Canada was better than in the United States, and he came over to get in on the business that he thought would be moving. He went back after finding that there was nothing in this field for the present to interest him.

The Cut in Wages

In the steel market one hears the question: "Will there be a cut in prices of steel following the reduction in wages of the United States Steel Corporation?" There has been a lot of publicity given to this point, one of the Toronto papers using the following:

"It is taken for granted that further cuts in steel prices will follow the wage cut, which reduces the price of steel by about \$8 per ton."

Local representatives of the United States Steel Corporation stated that they had heard nothing at all about any contemplated changes in the schedule of prices and pointed out that the price of steel had been cut first and the price of labor after, whereas they both had a close relation.

Other steel merchants expressed the belief that it was a mistake to make two moves on the subject. "If the Corporation had cut their prices and the price of labor at the same time they would have done a much better piece of business. As it is we have this unsettling element in the market again, and people are asking whether there is going to be a further reduction, whereas a week ago it was generally accepted that the price was going to stand for some time."

TRADE OPENINGS IN ARGENTINA

Mr. Pollard Is In The City For a Time Looking For Suitable Trade Connections

H. Pollard, who has been spending some time recently in Argentina as the representative of the Handley-Page Co., is in Toronto. Mr. Pollard, during the war, was sent to this country as an instructor in the mechanical and engineering departments of the big Leaside flying camp. He made a splendid record while there. During his stay in Canada Mr. Pollard contributed a number of articles to Canadian Machinery and also published a handbook for the use of airplane mechanics. Leaving here at the conclusion of the war he returned to England for purposes of demobilization, and has since been with the Handley-Page Co. For a time he was on the London to Paris trip, then in Spain and

Portugal for a time. Following this he went to Argentina and Uruguay for the same company, and was successful in placing some thirty of their machines.

Mr. Pollard has been impressed with the opportunities there are in Argentina for Canadian lines. United States firms and British houses are well represented there, but not so with Canadian companies. He is in Toronto at present and

has been in touch with several engineering and machinery lines, openings for which he believes exist in Argentina. Mr. Pollard for the present is staying at the Gladstone Apartments, 225 Gladstone Ave., Toronto (phone Parkdale 3222) and if there are any Canadian manufacturers interested in having their lines placed in that country Mr. Pollard can be communicated with as above.

U.S. STEEL MILLS ARE RUNNING AT ABOUT 30 PER CENT. CAPACITY

Special to CANADIAN MACHINERY.

PITTSBURGH, May 12. — Production of pig iron in the United States is now at the rate of about 14,000,000 tons a year, which compares with rates of 39,000,000 tons last October and 40,000,000 tons in March, these being the two high months of the year. Actual production as officially reported was 36,925,987 tons in 1920 and 39,434,794 tons in 1916, the record year. Thus the present rate of output is extremely low and indeed is lower than the actual production in any year since 1900. By comparison with capacity the showing is still worse, for the capacity is considerably in excess of outputs previously attained. In 1916 there was production approximately equal to the existing capacity, but since then the capacity has been materially increased, for very little of the war-time construction became effective in 1916. Last year there was an effort during the first eight or nine months to make maximum output, but transportation difficulties prevented any full attainment, chiefly through causing a shortage of coke.

The capacity is fully 45,000,000 tons, this figure not representing theoretical capacity, but the actual production that could undoubtedly be realized if there were reasonably fair manufacturing conditions, such as existed in 1916, and were normal before the war, including proper transportation service and an adequate supply of efficient labor. Compared with 45,000,000 tons capacity the present rate of production of 14,000,000 tons a year is 31 per cent.

The merchant blast furnaces make a much poorer showing than the steel works furnaces, since the merchant furnaces are producing at the rate of only about 2,000,000 tons a year, their capacity being approximately 12,000,000 tons, so that their rate is only about 17 per cent. The steel works furnaces are producing at about 12,000,000 tons a year, or 36 per cent. of their estimated capacity of 33,000,000 tons.

The chief reason the merchant furnaces are operating at a much lower rate than the steel works furnaces is not that there is a much smaller demand upon the malleable and gray iron foundries, steel foundries and detached steel works that use merchant pig iron, as compared with demand upon the steel

works that have blast furnaces of their own, though there may be a little difference in this respect. The difference is due chiefly to the existence of stocks of merchant pig iron in the hands of both producers and consumers. The steel works that have blast furnaces naturally do not stock pig iron to any extent, partly because they do not buy or sell, and partly also because they normally use molten iron, which is much more economical, and make it as they consume it. In the case of merchant iron, on the other hand, consumers normally carry stocks and some months ago these stocks increased, while the furnaces also have stocks. A blast furnace must either run or not run and the merchant furnaces are either single or in small groups. As demand slumped off suddenly the average furnace, before blowing out, shipped all the iron on contract that the customers would take, and also made up some stocks preliminary to blowing out. Numerous furnaces announced late last year that they would not make any stocks, but that on account of high costs they would blow out as soon as they became unable to ship their make, but in practice the theory was violated.

Not Stocking Up Now

The conclusion from all this is that the rate of consumption of merchant pig iron is in excess of the current production and that as stocks are consumed a steadier market will develop. That there will then be higher prices than those now ruling is a possibility but it is somewhat more likely that prices will decline further before there is an upturn. A factor that may intervene before pig iron prices tend to stiffen is that of freight rates on ore, limestone and coke. These are expected to come down and that would decrease furnace costs. It is fairly safe to make one prediction, that before the end of the year there will be an advance in pig iron, from whatever low point is meanwhile developed. That is, some pig iron is likely to be sold at lower prices than the price that would encourage an idle furnace to blow in. An idle furnace does not lose much money, while it is very awkward to have a furnace in blast and making a fresh cast of iron every six hours, Sundays included, if there is no market

for it. Accordingly there will have to be inducements before idle furnaces blow in.

Steel Market Stagnant

The steel situation is no worse than it was, but it looks worse because there was good reason to expect an increase in mill operations on account of the price changes in the second week in April. At that time the independents advanced their prices and the Steel Corporation reduced its prices, resulting in the equalized market that is now steadily maintained. As the independents were withdrawing their lower prices they cleaned up all the new business in sight, at the lower figures, and this was expected to give them a better operation, though of course only for a time. The Steel Corporation, on the other hand, was in line to receive heavier specifications from its regular customers, having old contracts, since the contract figures were revised when the Corporation reduced its prices.

In neither case has there been an increase in operations, and naturally this is disappointing, though fundamentally the situation is no worse than it was a month ago. The independents are operating at about 30 per cent. of capacity and the Steel Corporation at about 35 per cent., making an average of about 33 per cent. for the whole industry.

While 33 per cent. is a very low rate, the tonnage itself is not so bad. What has been intimated about pig iron, as to increase in capacity, holds more strongly still as to steel, for there has been a 50 per cent. increase in steel capacity since 1914. Thus a 33 per cent. operation now is the same tonnage as a 50 per cent. operation would have been in 1914, while it is equal to a 66 per cent. operation with the capacity of about twelve years ago and a 100 per cent. operation with the capacity of eighteen or nineteen years ago. One may say that the steel capacity has grown too fast for present conditions, and in a sense that would be true, but at a long range view the more reasonable opinion is that conditions as to the consumption of steel are not what they should be, being distinctly unfavorable. The artisans in the building trades are unwilling to work hard and want more wages than investors feel it safe to tie up in construction work. It costs too much wages to keep the railroads going, on account of high rates and too many men on the payrolls, and the railroads cannot make improvements that the country needs. Thus it is all along the line.

While steel prices are absolutely unchanged since the equalization some four weeks ago, pig iron is easier. The \$24, valley, quotation on foundry pig iron, intimated last week as a possibility, has become an actual fact, and perhaps \$24 could be shaded a trifle. Basic iron has again sold at \$22.50, with a rumor that \$22 has been done or could be done.

The Portsmouth, O., blast furnace that recently bought a five weeks' supply of Connellsville coke, 500 tons a day, at \$3.50, has renewed the contract for 30 or 60 days at \$3.40. Foundry coke remains quotable at \$5 to \$5.50.

Scrap Metal

Pittsburgh reports that the improved tone of the market noted a week ago is maintained due to the fact that a number of the independent steel companies have put on additional open-hearth capacity in the past week, and that they are more interested in supplies of scrap than they were a very short time ago.

Consumers have been in the market during the week at Chicago, and while they have not made large purchases they have purchased sufficient quantities to advance the prices of a number of grades.

On the New York market, the big heavy melting steel consumer in eastern Pennsylvania, which came into the market recently for considerable tonnage, is reported to have filled its requirements. Business is at a very low ebb, and there is talk among some dealers of shutting down yards until there is greater activity.

The interest at Buffalo, which has bought approximately 5,000 tons of heavy melting steel in the past month, is reported willing to buy up to 10,000 tons at a \$13 price.

The spurt of buying which was noted last week at Cleveland was short lived, and the market has again settled down to a generally inactive state.

Pig Iron Market

The April output of pig iron was a daily average of 39,768 tons, or less than any daily rate since July, 1908, when the country's capacity was much smaller. Fifteen furnaces were blown out or banked in April, but nine were blown in.

Little of interest has taken place on the Pittsburgh market during the past week outside of an additional purchase of 2,000 tons of basic by the Sharon Steel Hoop Co. at \$22.50, furnace, from a valley steel maker.

On the Chicago market melters are buying from hand to mouth and orders of 100 tons or more are the exception.

Prices as low as \$24, base, on eastern Pennsylvania and Buffalo iron, and \$22 on No. 2 southern have been rumored on the New York market, but no transactions are reported at these low prices.

Though there is little life in the Cincinnati market, the feeling is better. Shipping instructions for iron held up are being received.

Boston reports that the Sullivan Machinery Co., Claremont, N.H., this week closed on 100 tons Pennsylvania malle-

able, 100 tons eastern Pennsylvania silicon 2.25 to 2.75 and 100 tons Virginia No. 1-X iron at private terms. Other sales were confined to an occasional car lot.

Little activity developed during the week at Cleveland. Owing to intimations from buyers that foundry and malleable iron can be bought at considerably lower than recently quoted prices, the market is in a rather unsettled state as regards prices. One sale was made of 500 tons of malleable iron to a Barberton foundry and the purchaser got a price lower than \$24.

No improvement is noted in the demand for pig iron on the Philadelphia market. Sales of carloads and 100 to 300-ton lots predominate and purchases are almost wholly for prompt shipment, though a few buyers are apparently willing to cover for two or three months ahead at present prices. Sellers, however, are not willing to sell ahead, as they hold that if prices should decline further the buyer would insist upon a revision of price on his contract, but would not consent to an advance should prices go up.

LET RAIL ORDERS ONLY "AT A PRICE"

Matter Came Up During a Debate on the Matter in the House at Ottawa

OTTAWA.—That certain individuals were given to attempting to use political influence to secure contracts for ties, and that it was the business of the committee to frown on such practices, was stated before the special Parliamentary Committee on Government-owned railways and shipping by Hon. T. A. Crerar, Progressive party leader.

While Mr. Crerar had every sympathy with the farmers "getting out" ties, the railways must be run on well-accepted business principles. Railway officials would not be fulfilling their duties if they permitted themselves to be influenced.

Buy in Best Market

R. C. Vaughan, vice-president and director of purchasing and supplies for the National Railways, said the ties were purchased where the price was favorable to the railways. Other supplies were purchased on a similar basis. Mr. Vaughan gave an explanation of the purchasing methods, and said the directors did not interfere, except in the case of extra large purchases.

Later Mr. Crerar said a section of the public looked on the National Railways as a cow that could be milked, and he, for one, objected to being an agent between the public and the railway even for his own electorate. The public would do its business direct with the company.

Compare Rail Costs

Mr. Vaughan informed Mr. Murphy that few rails were purchased in the

United States. The United States price was \$48.60 a ton, and the Canadian price \$67 a ton. The Canadian price was lower than the United States rails when exchange, duty and freight were considered.

Dr. Reid said the Canadian companies reduced the price to \$60 a ton. This price, however, was considered unfair, as the directors of the road thought the Canadian price should not exceed the American price plus duty. The Algoma Steel Co. agreed to this, and took a contract for 55,000 tons at \$55 a ton.

So far the Dominion Iron & Steel Co. had not "come to time."

HARDER TO HOLD MEN'S CONFIDENCE

Manufacturer Tells Of Case Where His Men Asked For Records To Prove His Words

A manufacturer who takes a great deal of pride in his business, and who has always tried to make conditions as desirable as possible around his plant, discussed an interesting point with Canadian Machinery.

"One of the hardest things I have to do," he remarked, "is to get a basis on which to deal with the men in my own shop. I do not know exactly what is the trouble, but I have a well fixed belief that when I meet my men in conference regarding business conditions and matters of wages there is an element of suspicion that makes it harder for me to make progress. Just a few days ago there was a committee in here and we went over the situation in detail. I stated the case as fairly as I knew how, and I proposed just as small a cut as possible because I realize that the cost of living is still pretty well up. When I was through I was met with a request that I produce my books and the records of my business office in order that the men might verify the statements that I had made. I know this is a day when there is not much sentiment in business, and when people are generally held to be robbers until they are found to be not guilty, but that was the hardest thrust I ever received. I haven't been out in the shop since because I haven't the heart to go out, and it is one thing I miss more than anything else. I was brought up in this shop, and I know the men. I have discussed the matter with other manufacturers, and find that they have had somewhat the same experience. I don't know whether it is the men's organizations or what encourage these moves, but I am bound to confess that it is making it harder for me to feel that I have the co-operation and sympathy and backing of my men in going through a period such as we are experiencing right now."

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	\$25 00
Lake Superior, charcoal, Chicago. 40 50	
Standard low phos., Philadelphia. 41 50	
Bessemer, Pittsburgh	28 96
Basic, Valley furnace	26 00
Toronto price:—	
Silicon, 2.25% to 2.75%	34 10

IRON AND STEEL

Per 100 lbs. to Large Buyers	Cents
Iron bars, base, Toronto	\$4 00
Steel bars, base, Toronto	4 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	3 75
Steel hoops	4 50
Tire steel	4 00
Spring steel	6 00
Band steel, No. 10 gauge and 3-16 in. base	4 00
Chequered floor plate 3-16 and heavier	6 00
Bessemer rails, heavy, at mill.	2 35
Steel bars, Pittsburgh	2 10
Tank plates, Pittsburgh	2 20
Structural shapes, Pittsburgh	2 20
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 48
Structural shapes	3 58
Plates	3 78
Small shapes under 3-in.	3 48

FREIGHT RATES

	Per 100 Pounds	
Pittsburgh to Following Points	C.L.	T.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½
Current surcharge, 8 per cent.		

METALS

	Gross	
	Montreal	Toronto
Lake copper ..	\$18 00	\$17 50
Electric copper ..	17 50	17 50
Castings, copper ..	17 25	18 00
Tin	38 00	39 00
Spelter	7 75	7 50
Lead	6 50	7 50
Antimony	8 00	8 25
Aluminum	34 50	30 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	\$5 00	\$4 75
Plates, ¼ up	4 50	4 25

PIPE—WROUGHT

Standard Butt-weld Pipe S/C

	Steel		Gen. Wrot Iron	
Size	Blk.	Galv.	Blk.	Galv.
¼ in.	\$ 6 50	\$ 8 50	\$ 5 91	\$ 8 01
½ in.	4 89	6 99	5 91	8 01
¾ in.	4 89	6 99	5 91	8 01
1 in.	6 50	8 03	7 95	9 48
1½ in.	7 99	10 06	9 95	12 02
2 in.	11 82	14 88	14 71	17 77

1¼ in.	15 99	20 13	19 90	24 04
1½ in.	19 11	24 06	23 79	28 14
2 in.	25 72	32 38	32 01	38 67
2½ in.	40 66	51 19
3 in.	53 17	66 94
3½ in.	67 62	84 18
4 in.	80 12	99 74

Standard Lap-weld Pipe S/C

Per 100 feet.

	Steel		Gen. Wrot Iron	
Size	Blk.	Galv.	Blk.	Galv.
2 in.	\$29 42	\$36 08	\$35 71	\$42 37
2½ in.	44 17	54 70	54 11	64 64
3 in.	57 76	71 53	70 76	84 53
3½ in.	69 46	86 02	85 10	101 66
4 in.	82 30	101 92	100 83	120 45
4½ in.	95 89	1 20	1 30	1 54
5 in.	1 12	1 40	1 52	1 80
6 in.	1 45	1 81	1 97	2 33
7 in.	1 89	2 37	2 53	3 01
8 in.	1 99	2 49	2 66	3 16
9 in.	2 29	2 87	3 07	3 64
10 in.	2 74	3 43	3 67	4 36
12 in.	2 54	3 18	3 41	4 05
14 in.	3 28	4 10	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4 in. and under, 50 per cent.	
4½ in. and larger, 40 per cent.	
4 in. and under, running thread, 20%.	
Standard couplings, 4-in. and under, 20%	
Dd., 4½ in. and larger, net.	

OLD MATERIAL

Dealers' Average Buying Prices

	Per 100 Pounds.	
	Montreal	Toronto
Copper, light	\$ 8 50	\$ 9 00
Copper, crucible	11 00	11 00
Copper, heavy	10 50	11 00
Copper wire	11 00	11 00
No. 1 machine composition	9 50	9 75
New brass cuttings ..	6 00	8 00
Red brass turnings ..	7 25	8 00
Yellow brass turnings ..	5 00	6 00
Light brass	3 50	5 00
Medium brass	4 50	6 00
Scrap zinc	4 00	4 00
Heavy lead	3 75	4 00
Tea lead	2 00	2 00
Aluminum	12 00	10 00

	Per Ton	Gross
Boiler plate	\$10 00	\$12 00
Heavy melting steel ..	9 00	14 00
Axles (wrought iron) ..	20 00	20 00
Rails (scrap)	12 00	14 00
Malleable scrap	12 00	20 00
No. 1 machine cast iron	22 50	25 00
Pipe, wrought	8 50	8 00
Car wheel	22 00	25 00
Steel axles	18 00	18 00
Mach. shop turnings ..	5 00	6 00
Stove plate	17 00	20 00
Cast boring	3 00	7 00

BOLTS, NUTS AND SCREWS

	Per Cent
Carriage bolts, 7-16 and up.	Net list
Carriage bolts, ¾" and less	15
Coach and lag screws	—20
Stove bolts	55
Wrought washers	—25
Elevator bolts	Net
Machine bolts, 7-16 and over.	—5
Machine bolts, ¾ in. and less.	—30
Blank bolts	Net

Bolt ends	—5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	Net
Machine screws, o. and fil. hd., brass	Net
Nuts, square, blank	+25 add \$2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 25
Nuts, hex., tapped	add 2 75
Copper rivets and burrs, list less.	27½
Burrs only, list plus	10
Iron rivets and burrs	37½ and 5
Boiler rivets, base ¾" and larger	\$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	67½
Wood screws, flat, bright	67½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cwt
Set screws	Less 40%
Square and hexagon head cap screws	Less 30%
Round head cap screws	Plus 10%
Fillister head cap screws	Less 10%
Flat head cap screws	Net list
Button head cap screws	Plus 10%
Studs	Less 20%
Semi-finished nuts up to and including 1-in.	Less 35%
Semi-finished nuts 1½ to 1½" ..	Less 30%
Semi-finished nuts 1½ to 2 in.	Net list
Coupling bolts	Plus 10%
Taper pins	Less 40%
Planer bolts without fillet	Plus 40%
Planer bolts with fillet	Plus 50%
Patch bolts	Plus 80%
Hollow set screws	Plus 20%
Thumb screws	Less 35%
Thumb nuts	Less 65%

BILLETS

F.O.B. Pittsburgh.

	Per gross ton
Bessemer billets	\$43 50
Open-hearth billets	43 50
O.H. sheet bars	39 00
Forcing billets	48 50
Wire rods	48 00

NAILS AND SPIKES

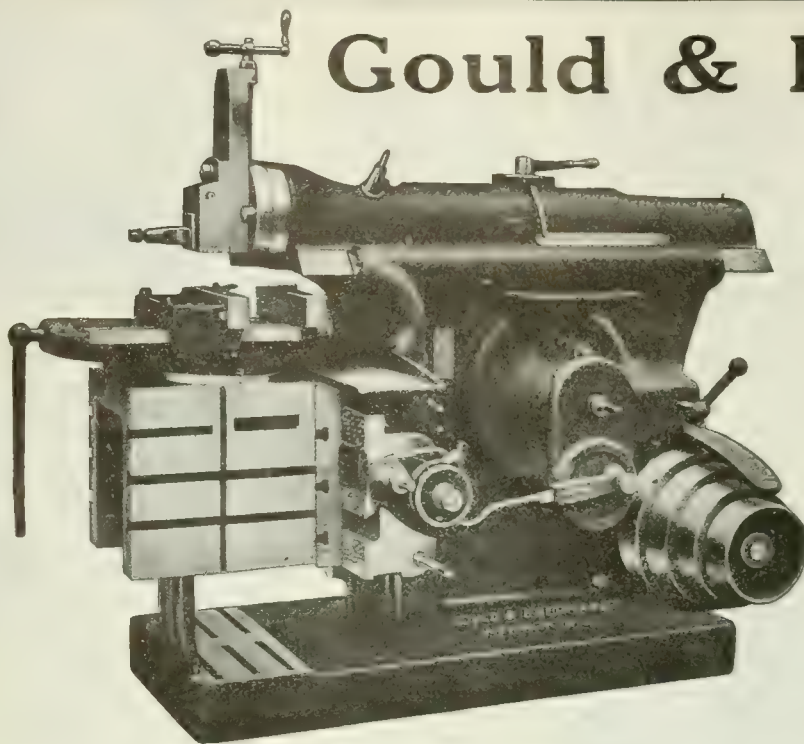
Wire nails, base	\$4 55
Cut nails, base	5 10
Miscellaneous wire nails	50%

ROPE AND PACKING

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 26
British Manila rope	0 20
New Zealand hemp	0 20

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	Net
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61 ft. frontage by 134 ft. depth; five stories high. Especially constructed for manufacturing purposes.

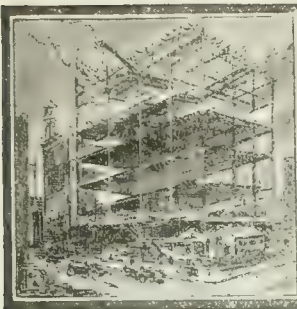
Slow-burning construction; equipped throughout with automatic sprinklers.

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INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



UNITED STATES STEEL CORPORATION HAS CUT 20 PER CENT. ON ITS WAGES

THE long deferred action of the United States Steel Corporation in regard to the reduction of wages was taken Tuesday, May 3, when late in the afternoon it was announced that a decrease of about 20 per cent. had been agreed upon. A meeting of presidents of the Steel Corporation subsidiaries was held Monday and on Tuesday a meeting of the finance committee of the corporation was held. Shortly before five o'clock, the following statement was made by Judge Gary:

"The wage rates of day labor at the manufacturing plants of the Steel Corporation have been decreased about 20 per cent. to become effective May 16 instant. Other rates, including salaries, will be equitably adjusted.

"After long and painstaking effort, we have not been able to find a practicable basis for the entire abandonment of the twelve-hour day or turn in the immediate future. However we have already eliminated the twelve-hour day in certain departments and shall continue our efforts in this direction with the hope and expectation of making the elimination of the twelve-hour day complete during the next year. We do not believe we can satisfy our employees with any shorter limit."

Reductions of wages of 20 per cent. were made by independent steel companies, effective Feb. 16, 1921, and independent coke operators reduced wages from 22 to 23 per cent. effective April 1.

The Steel Corporation had adhered to its schedule, which had not been changed since the announcement of Feb. 1, 1920, of the ninth advance in wages made since Jan. 1 1916. The wage advance since 1914 amounted to about 140 per cent. The following are the dates and percentages of advances of the Steel Corporation since Feb. 1916: Feb. 1, 1916, 10 per cent.; May 1, 1916, 10 per cent.; Dec. 15, 1916, 10 per cent.; May 1, 1917, 10 per cent.; Oct. 1, 1917, 10 per cent.; April 15, 1918, 15 per cent.; Aug. 1, 1918, 10 per cent.; Oct. 1, 1918, 10 to 16 2-3 per cent. (through reduction of working hours); Feb. 1, 1920, 10 per cent. The last reduction in wages was made in January, 1904, but wages were restored April 1, 1905, to the schedule which had prevailed previous to Jan. 1, 1904.

The average salary or wage per employee per day of all employees, exclusive of general administrative and selling force has been; 1912, \$2.68; 1913, \$2.85; 1914, \$2.88; 1915, \$2.92; 1916, \$3.29; 1917, \$4.10; 1918, \$5.33; 1919, \$6.12; 1920, \$6.96.

Opening Office.—In charge of Morris P. Shea, the Dominion Steel Products, Limited, Brantford, have opened an office at 416 St. James St., Montreal. They are installing a stock of lighting sets and accessories as well as Darling valves and hydrants and other products.

Change Management.—As the result of a recent re-organization, Welland Machine & Foundries, Limited, Welland, will operate under the management of Wm. Edestrand, at one time with the Dain Manufacturing Co., and an experienced foundryman.

Will Change Foundry.—Hillis & Sons, Halifax, N.S., are still operating in a temporary foundry, following the explosion of December, 1917. The new foundry will be of brick or concrete, and much larger than at present. As soon as conditions warrant they will be adding to the plant and equipment in different directions.

CONDITIONS IN BRITISH FIELD

C. W. Field, representative in this district of the British Overseas Trade Organization, has returned from an extended visit to the Old Country, during which he called on a great many firms there that had been doing business in Canada. In many cases the business had been carried on in a half-hearted way, the firms there not realizing the importance of the Canadian market, nor appreciating as they should the purchasing power, per capita, of the Canadian people.

"I found," remarked Mr. Field, "that the large amounts of left-over war material that were still in the land had a depressing effect on trade in these particular lines. There are, for instance, great piles of wool, and immense stores of wheat, as well as considerable heavy machinery."

The labor situation, he thought, although far from what it should be, was improving. Many employees were offering to accept lower wages and others were more inclined to listen to reasonable arguments of manufacturers as to the vital necessity of reducing costs in order to compete in the world's markets. "I have great faith in the triumph of moderate opinion in the Old Land," said Mr. Field. "This year will probably be another one of readjustment but condi-

Engineering

The Nukol Fuel Co., Ltd., 88 Bay Street, Toronto, are contemplating the erection of a factory.

Plans are prepared for a garage to cost \$20,000 for A. Clancy, c.o. P. L. Davis, architect, 157 Danforth Avenue.

The erection of a woodworking factory costing \$10,000 is planned by McCulloch Bros., at Derbert, N.S.

The Special Auto Service Co., Hamilton, Canada, will alter building for garage at a cost of \$10,000 and will also erect a garage on Dundurn St. N.

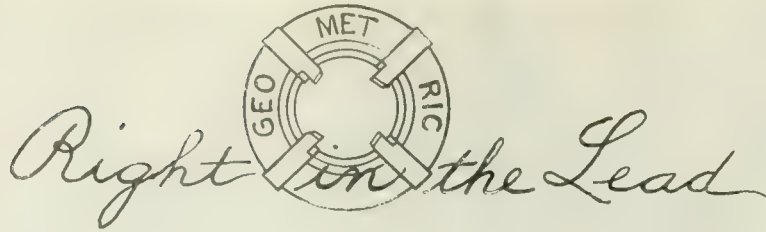
Feather and Roadhouse, 11 Foster Place, have received the sheet metal contract for alterations and additions to building for offices costing \$50,000 for the Consumers' Gas Co., 19 Toronto Street, Toronto.

Trade Gossip

Wants Shop Equipment.—Harry M. Bell, R. R. No. 2, Wallenstein, Ont., wants to secure a complete emery grinder and some general shop equipment.

Wants Equipment.—P. E. Nesselth, of Mattawa, Ont., wants to secure the following, used or new: vise, 4 to 6 in. jaw, swivel or rigid; drill press, to take square or round shank up to 5/8 in.; double emery cylinder head to take 10 x 1 in. wheels.

Wants Equipment.—C. R. Wright, 190 West 101 street, New York City, wants to secure the following used equipment: Air compressor, size 9 x 8; ball mill, 4 x 5; filter press, 30 in. x 30 in.; (Shriver or similar type) 48 wooden frames and plates, open delivery. This equipment is to be used in Canada.



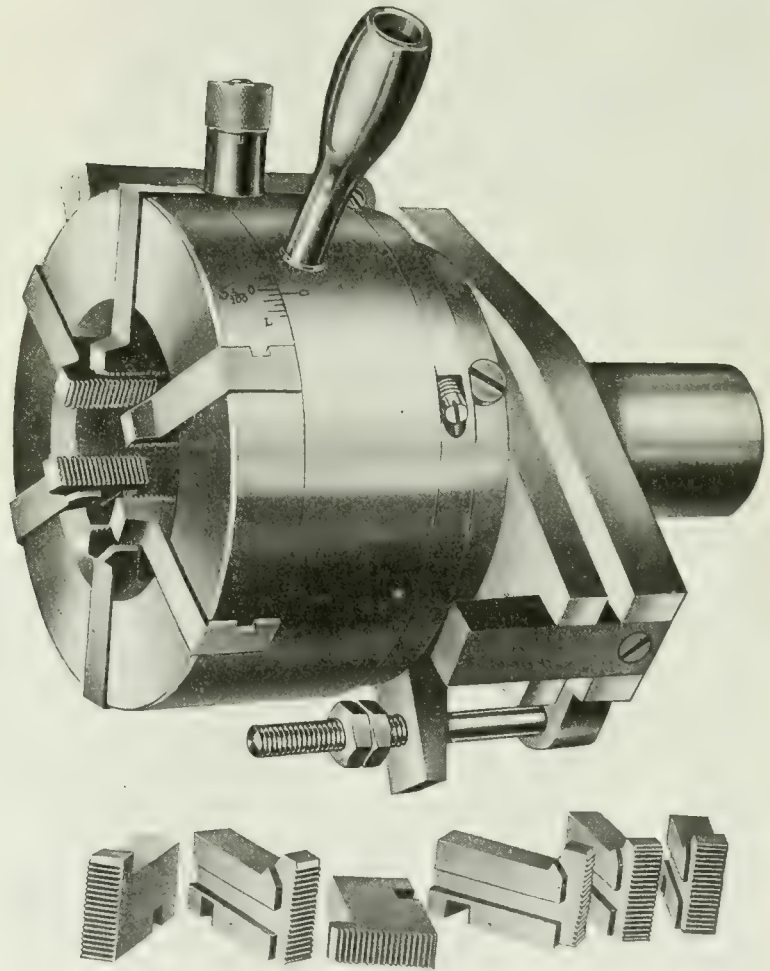
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The Geometric Die Head illustrated is arranged for the Potter & Johnston Automatics. Note the Floating Shank, which makes close camming unnecessary and also prevents inaccuracies caused by either forcing or holding back the turret.

Geometric Die Heads can be fitted with chasers for cutting close to a shoulder, when required

THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, St. John, N.B., Halifax, N.S.

tions are gradually improving and we may expect to see John Bull take a much more intimate interest in the Canadian market.

The coal strike, he admitted, would probably set things back for at least another three months.

"I visited the principal industrial centres overseas and my outstanding impression is that the United Kingdom is again approaching a strong position for the conduct of export trade. Machinery and equipment are modern, office and works systems are satisfactory, and there is a keen desire to extend overseas trade. Given better conditions in the supply of raw materials and steadier labor conditions, the United Kingdom will, I believe, again assume in the world's markets its important role of the past.

"The present business depression is apparently helping to bring the readjustment which is necessary for the revival of trade. During this period, employers and labor appear to be making efforts to ensure that fair wages shall be paid and the proper output obtained.

The poor habit that some Canadian firms had formed during recent months of cancelling orders without any good reason other than that they desired to

escape a falling market had left a bad impression at certain places in England. Mr. Field told of one firm that had dyed a \$60,000 order especially for a Canadian customer, and the whole thing was cancelled when it was boxed for shipping. It was a dead loss, and the Canadian customer had refused to make any settlement.

HOW STRIKES GO ACROSS THE LINE

Reports of Various Wage Disputes and the Nature of Their Settlement

New York.--The opposition of union molders employed in machinery foundries to the wage reductions that have been announced since the opening of the year has been disintegrating rapidly since the acceptance by the International Molders' Union of a 15 per cent. reduction of wages in stove foundries. It has been estimated recently that 60 per cent. of the members of the union have been out of work, and a considerable portion of the remaining 40 per cent. have been working part time. On April 1, molders' strikes were in progress in one or more shops in 109 cities. Among the settlements already made, some of which an-

ticated the settlement between the molders and the stove founders, are the following:

On April 5 the union foundries in Pittsburgh gave notice of a readjustment of wages and the local union arranged for a reduction from \$7.50 to \$6.75 for eight hours. It was provided that this should be effective for 90 days from April 1.

At Detroit a reduction from \$8.50 to \$7.20 for eight hours was put in effect April 11, and was accepted by the union. On April 1 a large union foundry in Detroit which had been shut down for some time offered a wage rate of 85c per hour and this was accepted by the employees.

A reduction from 90c to 80c per hour was put in effect by the union foundries of Ansonia and Derby, Conn., on April 18, and was accepted by the molders' union.

Union molders at Baltimore who have been on strike against a reduction from \$8 to \$7 for eight hours have called off the strike and are seeking employment on the \$7 basis. A number of foundries there, however, expect to maintain the open shop and are only employing men as individuals without any agreement with the union.

The Week's Events in Montreal Industry

Thos. McMillan, first vice-president of the Canadian Fairbanks-Morse Company, was in Chicago last week attending the funeral of Charles Hosmer Morse, late president of the Fairbanks, Morse Company.

* * *

O. H. Willison, of the Lyman Tube and Supply Company, Montreal, has just returned from a six weeks' trip to England, where he spent a month at the plant of the Hoffmann Manufacturing Company, the largest manufacturers of ball and roller bearings in the British Empire. The Lyman Tube and Supply Company were representatives of this firm prior to the war, but for the past five or six years it has been impossible to obtain shipments from England. The Hoffman bearings are made in a large variety of styles and sizes to meet every industrial requirement. The radial ball bearings are made in both the "gap" and the "no gap" type. The Lyman Tube and Supply Company will carry a large stock of Hoffman equipment in their various Canadian warehouses.

The launch of the Norwegian cargo vessel "Topdalsfjord" from the yard of the Canadian Vickers last Thursday marks the cessation of operations at this plant for some time, at least in the nature of new work. Repairs to vessels afloat will be continued throughout the season, but unless new contracts are received the construction of new vessels

will cease. There is a slight possibility that this company may be the successful tenderers for the ice-breaker that the government proposes building this year, but no definite announcement regarding this has yet been made. This last launching was attended by the members of the Federal Parliament in a body, and on the occasion of their visit to Montreal they were given a trip around the harbor as guests of the Harbor Commissioners, during which the new steel sheds of the Commissioners were officially opened.

* * *

C. E. Simon, of London, England, sales manager for the Swedish Machine Tool Makers Export Company, Limited, Stockholm, Sweden, has recently arrived in Canada for the purpose of studying industrial conditions and the advisability of establishing agencies in Canada and the United States for the different Swedish and English firms he represents. After spending a week or so in Montreal and Toronto Mr. Simon will visit the principal machine tool centers in the United States with the same object in view. It is possible that arrangements may be made for the manufacture of some of the lines in Canada or the States. The fundamental plan of the Swedish Machine Tool Makers Export Company is to facilitate the development of the specialties of each work. For this purpose a number of Swedish manufacturers made up an agreement between themselves regarding the machine types

to be built and to unify the separate sales organizations in a joint sales office. The Export Company is no reseller, but an integral part of the different firms represented. The organization will handle the product of the following firms: Svenska Maskinverken, manufacturers of engine and screw cutting lathes, capstan and hexagon turret lathes, automatic machines, cutting off machines, milling and gear hobbing machines and drill presses; Kopings Mek. Verkstad, builders of engine gap, and face plate lathes, centering machines, hand and power milling machines (plain and universal), horizontal boring machines, sensitive and column drilling machines, open side planing machines, cutter and tool grinders; Munktells Mek. Verkstad, manufacturers of lathes, power presses, forging and drawing presses, screw presses, belt driven drop and pneumatic hammers; Lidkopings Mek. Verkstad, makers of lathes, boring mills, drill presses, planers and grinding machines; Atlas Diesel, manufacturers of vertical boring and turning machines, vertical milling machines and steam hammers. In addition to the Swedish lines here mentioned, Mr. Simon will represent the English firm of Thos. Ryder and Sons, Limited, of Bolton, manufacturers of multiple forging hammers; special machine tools for making piston rings and crankshafts for automobile, gas and oil engines, and shaker cranks for agricultural machinery, and high speed all-gear engine lathes.

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Solve your Metal Cutting problems,
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We make Kwik-Kut Power Hack Saw Machines which use practically the full cutting edge of the Hack Saw Blade at each stroke; Metal Cutting Band Saw Machines for general shop work, cutting all classes of metal up to 12 x 14 inches.

Your requirements for Metal Cutting Circular Saws can be supplied promptly and we solicit a trial of our "AAA" Non-Breakable and Power Hack Saw Blades and Frames.

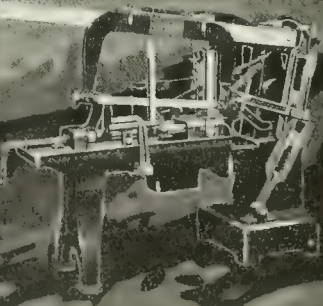
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TURRET LATHE PRACTICE

"Turret Lathe Practice," by Joseph G. Horner, is the title of a recent book published by Emmott & Co., Ltd., 65 King street, Manchester, England. The English price of this book is 12s. 6d., and following are the chapters embodied in the book:

Chapter 1 is devoted to cycle of operations, tools, bar lathes, lathes for chuck work, and economy of turret work. Chapter 2 discusses such operations as centering, facing, pointing, box tools, steadies, hollow mills, solid and adjustable box tools, roller steadies, examples of taper turning, tools and appliances, and swing tools.

Chapter 3 takes up the selection of drills, methods of holding, holders and chucks, forms of drills, oil grooves, and flat drills. Chapter 4 discusses reaming, the causes of variations in size, floating reamer holders, use of pilots, clearances, grinding, expanding reamers, etc. Chapter 5 shows sample boring tools, boring bars, boring heads, and examples of work performed, this including taper work.

Chapter 6 covers the subject of screw cutting, methods employed, types of holders and die heads, taper threading dies, examples of work, etc. The next chapter shows varieties of cross slides and work accomplished on the cross slide, such as knurling, profiling, forming, necking and so on. Chapter 8 illustrates examples of tool equipment, while the next section is devoted to the capstan and turret details.

Chapter 10 covers the design of headstocks, going into adjustments of certain portions. The last chapter discusses collet chucks and wire feeds, this covering the functions and operations of such chucks, the use of false jaws, the air-operated collet, work held by interior, special designed jaws, roller feeds, geared feeds, etc., etc.

This book is carefully written, well illustrated by line drawings, showing considerable detail in the construction of the various parts, and should prove of value to those interested in turret lathe work.

Trade Gossip

Rail Order.—The Algoma Steel Corporation has received an order from the Dominion Government for 50,000 tons of rails for the Canadian National Railways. It will require about two months to complete the work and the plant at Sault Ste. Marie is in full operation on the contract. Two thousand men are at work.

A Big Undertaking.—Charles Evans Fowler, engineer in charge of the proposed international bridge connecting Windsor and Detroit, stated that he is now preparing to award contracts, and he expects actual work will begin within six months. Operations will be started

on Detroit side first. The Windsor terminal will be located at the extreme easterly end of the town of Sandwich. The construction, which is expected to take six years to build, and an amount of money bordering on fifty million dollars, will be of cable suspension type with a single span 1,800 feet long stretching from shore to shore, with a clearance of 110 feet for vessels.

Secure United States Work.—In competition with eight other elevator companies, the Fegles Construction Co., the only Canadian firm tendering, received the contract for the construction of an eighteen hundred thousand bushel elevator in Brooklyn, N.Y. The elevator will be known as the Barge Canal Terminals at Gowanus Bay, Borough of Brooklyn, the contract being \$1,500,000. The terminals are to consist of fifty-four concrete tanks, a boiler house and power house, together with installation of machinery, the whole to be completed in every detail and ready for occupation by September 1, 1922.

That Wage Cut.—With reference to the 20 per cent. wage cut by the United States Steel Corporation, Ben I. Davis, journal manager of the union, stated that the wages of the men were based entirely on the selling price of products. Several wage reductions, the manager said, have been experienced during the past six months by reason of a falling market and the consequent decline in the selling price of iron, steel and sheet metal goods. He spoke of how steel puddlers a few months ago received \$18 per ton, whereas recent wage cuts had reduced that figure to \$13.67 per ton. This is the first time since 1904 that the wages have been cut and the second time in its history.

Build in Canada.—The English Electric Co. has announced its intention of extending operations to Canada, and it is understood that they will erect factories in Toronto for the manufacture of electrical machinery and equipment. The company, which is said to be the largest firm of its kind in the British Empire, and one of the most powerful industrial enterprises in the world, includes among its directorate Sir John Mansell, Lord Meston and representatives of John Brown & Co., Cammell, Laird & Co., Thomas Firth & Sons, and Harland and Wolff. M. Gordon F. Perry, president of the National Iron Corporation, Toronto, has been appointed chairman of the Canadian board.

The Anglin-Norcross, Ltd., of Montreal, have received the contract for the construction of the live stock arena at the Exhibition Grounds, Toronto. The firm's tender was for \$892,000, which was the lowest tender received. The building must be finished by November 1, 1921.

NEW CATALOGUES

Those interested in any of the catalogues described below can procure a copy of the same by writing direct to these firms. Mention that you noticed this in Canadian Machinery.

BOOK ON CONCRETE

The Truscon Laboratories, Detroit, Michigan, have issued a technical booklet, to be known as their pamphlet No. 8. In this booklet is a discussion of why concrete requires waterproofing, and the properties that an integral waterproofing must possess to operate effectively with the natural properties of concrete. To anyone handling concrete this book should be of interest.

NEW BULLETIN

The Wayne Oil Tank and Pump Co., Fort Wayne, Indiana, have issued their bulletin No. 2500, which contains some very interesting information regarding the burning of fuel oil and the equipment necessary to burn various oils. The advantages of fuel oil are given, also comparative costs with other fuels. Labor costs are also stated, and a general summary completes the first portion of the bulletin.

From then on the oil burning system, its installation, equipment necessary, etc., etc., are given, a table being included showing the types of furnaces used for various kinds of work. Numerous other tables are also given, and the bulletin should be of special interest to manufacturers in general.

METAL STATISTICS

The American Metal Market and Daily Iron and Steel Report, 81 Fulton St., New York, have placed on the market their 1921 edition of Metal Statistics, one of the handiest records of market tendencies and prices that could be secured. The information is put together in the form of tables that are easily followed. The book is generally accepted as the standard for market references. It is a valuable help to one who has cause to refer frequently to prices current in any line of iron, steel, or non-ferrous metals.

SAFETY PANELS AND CABINETS

The Crouse Hinds Co., of Canada, Ltd., Toronto, have a bulletin No. 1D, which covers their line of safety panels and cabinets. This takes up the general specifications, the steel trims, and various types of safety panels. To those interested this booklet should prove of service.

RADIAL DRILL CATALOGUE

The Western Machine Tool Works, Holland, Mich., have issued their catalogue No. 21 dealing with their line of low hung drive plain and universal radial drills. This book includes both the plain and full universal type of drills, and the various units going to make up these machines are discussed in detail. Specifications on all machines are included.

OIL ENGINE CATALOGUE

The Ker & Goodwin Machinery Co., Brantford, Ont., have issued a booklet on their Hvid type of oil engines. A detailed description of these engines is given, also instructions on how they are operated. In-

structions for adjusting the engine are also given, in fact the book is a regular operator's guide as well as a general bulletin on the engine itself.

WRENCH BOOK

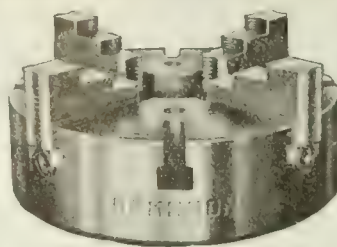
J. H. Williams & Co., Brooklyn, have issued a booklet taken in part from their seventeenth catalogue edition. This booklet covers various styles of wrenches for engineers, textile workers, and machinists in general. Socket wrenches, "S" wrenches, and pin and face spanners are included. Various complete wrench sets are also shown.

TRANSACTIONS AND YEAR BOOK

The University of Toronto Engineering Society have again issued their transactions and year book. This is the first publication of the society since the last issue of applied science in 1916, and the volume now issued contains many items of interest. Various papers in all branches of engineering are reproduced, and the latter portion of the book deals with University matters.

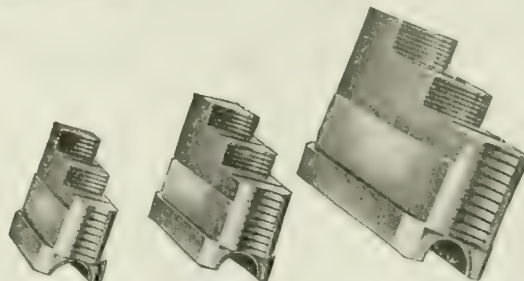
BOOK ON COUNTING MACHINES

The Root Co., Bristol, Conn., have compiled and issued a book called "The Census Takers of Industry." It covers various suggestions and illustrates the versatility of automatic counting machines, showing how they remove the human element from counting operations.



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ANNOUNCEMENT

The Electric Motor and Machinery Co., Ltd., 64 Wellington Street West, Toronto, Ontario, wish to announce the commencement of their sales agency for the

Howell Red-Band Motors Ltd.,
makers of "the Guaranteed Motor." (c19m)

CLOSING TIME

Condensed advertisements for this section must be in our composing room Tuesday morning prior to day of issue. Display advertisements for this section must be in Monday afternoon.

In order that the announcements of your wants, machinery for sale, etc., etc., shall not be delayed, please try to have them in our office with the Tuesday morning mail.

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Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day. Expert Metal and Wood Pattern Work. Our advice and estimates will save you money. Semi-finishing operations on Lathe or Grill on Castings supplied if required. ASK US.

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1- No 11 Brown & Sharpe Plain Grinder
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KVA	30	2300	Fairbanks-Morse	1200
KVA	35	2300	Allis-Chalmers	1200
	37½	2300	Westinghouse	1200
	42	2300	Electrical Machinery	1200
	45	1150	General Electric	1200
	50	550	Crocker-Wheeler	1200
	50	2300	Fairbanks-Morse	300
	50	2300	General Electric	900
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KVA	60	2300	Electrical Machinery	900

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- 5—1/2 h.p. Wagner, 110/220 volt, 25 cycle, 1500 rev.
- 1—1 h.p. Wagner, 110/220 volt, 60 cycle, 1800 rev.
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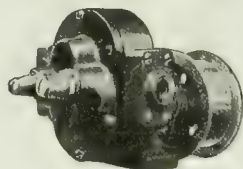
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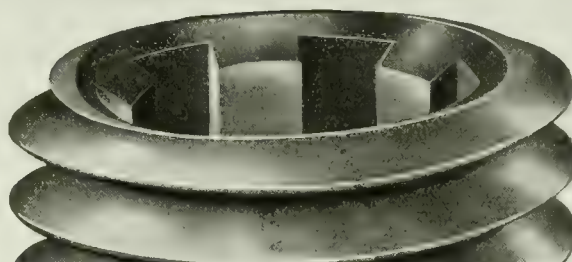
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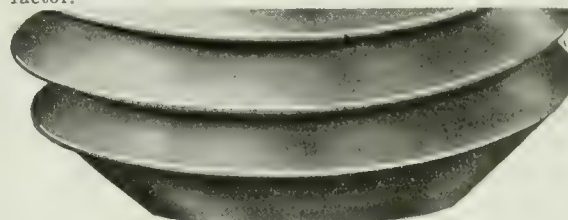
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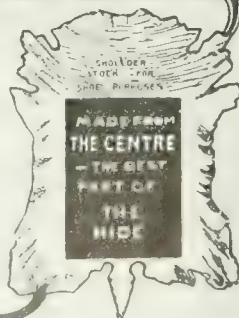


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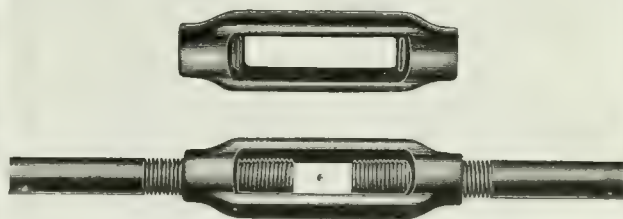
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FOUNDRIES & FORGINGS
LIMITED

Drop Forged Steel



SOLID—NOT WELDED

16 Sizes ^{with} } Stubs
 ^{without}

Canada Foundries & Forgings
Welland, Ont.

Do You Read These Advertisements?

Every advertisement in this magazine is worth reading. It is the product of some concern that is using a modern method of making sales, viz., technical paper advertising, in order to present most effectively to you the leading features of its line.

These advertisers are making it easier for you to buy intelligently with the least waste of your time and theirs. They realize that a sales force cannot replace this service at equal cost. They know that advertising is good business, for the manufacturer who does not advertise cannot save the cost of advertising. Consistent advertisers are progressive merchandisers. They are saving your money and their own; and it pays to do business with them.

Don't miss your opportunities. These advertisements are interesting. Many are distinctly instructive, and a glance through them every month will keep you posted on the latest developments for machinery equipment.



**KELLER-MADE
MASTER-BUILT**


THANKS—

To Mr. Wm. H. Keller—a line of Pneumatic Tools has been especially designed and built for your particular industry. Get our proposition on **KELLER-MASTER:**

Chipping Hammers	Corliss Valve Drills
Riveting Hammers	Valveless Drills
Scaling Hammers	Sand Rammers
Staybolt Riveters	Rotary Grinders
Jam Riveters	Rivet Cutters
Holders-on	Accessories

COMPLETE CATALOGUE ON REQUEST

KELLER PNEUMATIC TOOL COMPANY
GRAND HAVEN • MICHIGAN • U.S.A.
 BANK OF NOVA SCOTIA BLDG MONTREAL



DROP FORGINGS

Are sometimes cheaper than castings—Always far superior.

DROP FORGINGS

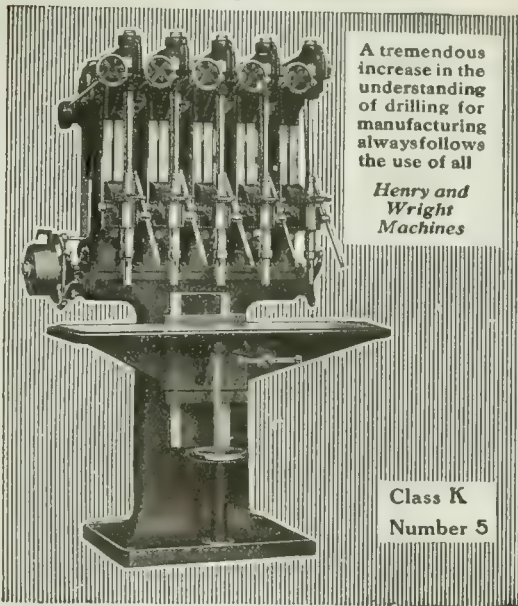
One of the Largest and Best Equipped Plants anywhere.

Dominion Forge & Stamping Co., Limited
 Walkerville, Ontario
 Toronto Office • Excelsior Life Building

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

HENRY & WRIGHT

Drilling Machines



A tremendous increase in the understanding of drilling for manufacturing always follows the use of all

Henry and Wright Machines

Class K
Number 5

The Henry & Wright Mfg. Co.
Hartford, Conn.

New York Office: 136 Cedar Street

Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg;
A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co., Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

NOVO-SUPERIOR

HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters,
Files, Etc.; Music Wire for Springs, Steel Balls,
Cold Rolled Too' Steel in Strips and Sheets,
Circular Saws, Machine Knives.

PILOT STEEL & TOOL COMPANY,
LIMITED

332 St. James Street, Montreal

Sole Agents for

JONAS & COLVER, LIMITED
Novo and Continental Steel Works
Sheffield, Eng.

H. BOKER & CO., Inc.
New York, N.Y.

ROCKFORD

—the best for varied work

General manufacturing plants prefer the **Rockford Miller** because they require a machine which they can depend on to do any work within its range to the complete satisfaction of the inspection department.

Simplicity of operation and absolute rigidity under every condition are distinctively **Rockford** features. They have made this the very best machine for general manufacturing.

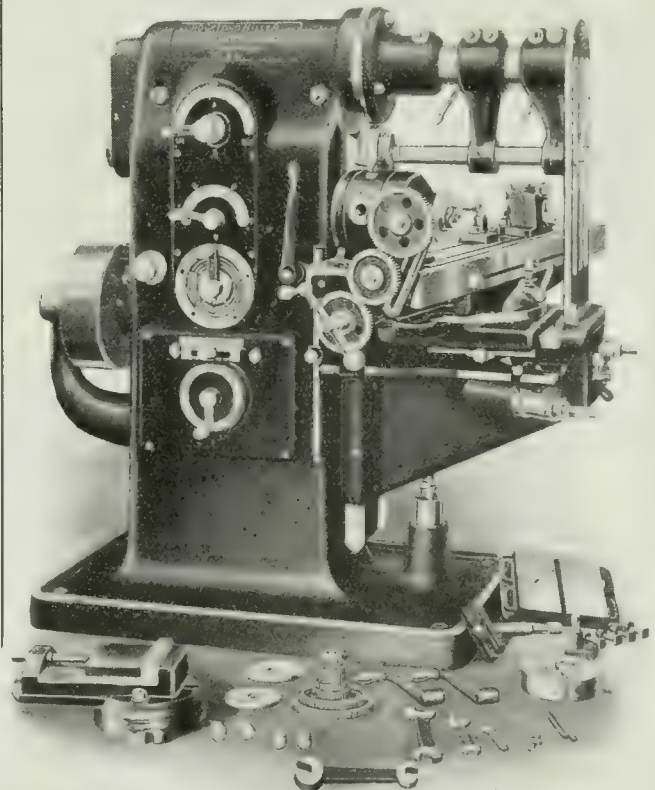
Full details on request.

Rockford Milling Machine Co.
Rockford, Illinois

Agents:

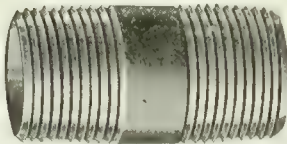
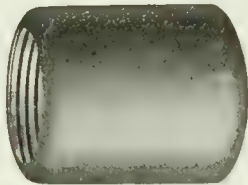
Rudel-Belnap Machinery Co.
Toronto

A. A. Jones & Shipman, Ltd., Leicester, England,
Great Britain; Louis Besse, Paris, France and
Belgium; Societa Anonima Adler & Co., Milano,
Italy, Italy and Colonies; Rylander & Asplund,
Stockholm, Sweden, Scandinavia; Casamitjana
Hermanos, Barcelona, Spain, Spain and Portu-
gal; Selson Engineering Co., Melbourne, Austra-
lia; M. Mett Engineering Co., Petrograd, Russia.



WROUGHT PIPE

COUPLINGS and NIPPLES



Each length of M.R.M. Pipe is tested to withstand a pressure of 600 pounds per square inch

Supplied in black, or galvanized.



HAMILTON

MONTREAL



THIS WASTE

and fire hazard go hand in hand where the oil is slopped around "any old way."

Which is yours?

Handling your oil in any old way, just because it is oil, or putting it in a safe like the real money it is? On the left is shown a picture of what daily happens where oil is stored in faucet or "jigger" pump tin cans.

BOWSER

ESTABLISHED 1885

Oil Storage and Distributing Systems

meet with the most particular insurance exactions—they have back of them over thirty years' pioneer work and study built into them—they are an investment and not an expense.

Send for illustrated descriptive literature—Give us some of the facts—the way and kind of oils you store and handle—whether volatile or non-volatile—lubricating or paint oils—and we will gladly co-operate with you.

Absolutely No Obligation Incurred in Writing

S. F. BOWSER COMPANY, LTD.,
Toronto, Canada

THIS SAVING



Canadian Machinery Buyers' Directory

If what you want is not here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index—last page of book, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

Abrasive Discs

Norton Co. of Can., Ltd., Hamilton, Ont.
Oskey & Sons, Ltd., John London & E., Eng.

Abrasive Materials

Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Montreal, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oskey & Sons, Ltd., John London, S.E., Eng.
William Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

Acetylene, Dissolved

L'Air Liquide Society, Toronto, Ont.

Accumulators, Hydraulic

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co. Duncan, Glasgow, Scot.

Air Cocks

Puro Sanitary Drinking Fountain Co., Bayville, Mass.

Air Lifts

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Independent Pneumatic Tool, Chicago, Ill.

Analyses, Chemical

Toronto Testing Laboratory, Toronto, Ont.

Angle Bars

Steel Co. of Canada, Ltd., Hamilton, Ont.

Anvils

Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdw. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

Arbors

Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.

Jacobs Mfg. Co., Hartford, Conn.

Kearney & Trecker Co., Milwaukee, Wis.

Kempson Mfg. Co., Milwaukee, Wis.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Skinner Chuck Co., New Britain, Conn.

Axles, Car

Dom. Foundries & Steel, Hamilton, Ont.

Babbitt Metal

Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Host Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.

Balls, Brass, Bronze and Steel

Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Barrels, Tumbling

McDougal Co., Ltd., R., Galt, Ont.

Bars, Boring

Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

Bars, Boring, Portable

Underwood Corp., H. B., Philadelphia, Pa.

Bars, Bronze Cored

Moore & Son, Thos., Montreal, Que.

Bars, Iron

Steel Co. of Canada, Ltd., Hamilton, Ont.

Bars, Steel

Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

Bearings, Ball

Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Bronze

Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Die-Cast

Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

Bearings, Journal

Fisher Motor Co., Ltd., Orillia, Ont.

Bearings, Roller

Can. Fairbanks-Morse Co., Ltd., Montreal, Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Belt Cement

McLaren Belting Co., J. C., Montreal, Que.

Belt Dressings and Fillers

Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'g Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

Belt Fasteners

Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'g Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Can. Fairbanks-Morse Co., Ltd., Montreal.

For list of Dealers see the last page of This Buyers' Directory

Belt Hooks

Torrington Co., Ltd., Upper Bedford, Que.

Belt Lacing

Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'g Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

Belt Lacing, Steel

Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing, Hinged

Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing, Flexible Steel

Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing Machines

Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'g Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Belt Joiners, Conveyor

Flexible Steel Lacing Co., Chicago, Ill.

Belt Tools

Graton & Knight Mfg. Co., Worcester, Mass.

Belting, Chain

Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Belting, Fabric

Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal, Goudreau Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'g Co., Ltd., Toronto, Ont.
Fox Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Summer & Co., New York City.

Belting, Leather

Atkins & Co., Inc., E. C., Indianapolis, I.

Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'g Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

McLaren Belting Co., J. C., Montreal, Que.

Smith Belting Co., Toronto, Ont.
Summer & Co., New York City.

Tullis & Son, Ltd., John, Glasgow, Scot.

Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.

Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

Federal Eng'g Co., Ltd., Toronto, Ont.
Oskey & Sons, Ltd., John, London, S.E., Eng.

Bench Countershaft Standards
Ford-Smith Machine Co., Hamilton, Ont.

Benches, Work
Aikenhead Hardware Ltd., Toronto, Ont.

Bending Machines, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.

Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.

Williams Machinery Co., A. R., Toronto, Ont.

Bins, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Blocks
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Chain (See Hoists, Hand)
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.

Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Wright Mfg. Co., Lisbon, Ohio.

Blocks, Die
Canada Foundries & Forgings Co., Welland, Ont.

Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.

Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

Blocks, Pillow
Can. Link-Belt Co., Toronto, Ont.

Blowers
Can. Blower & Forge Co., Ltd., Kitchener, General Combustion Co. of Can., Ltd., Montreal, Que.

Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Bolt and Nut Machinery
Acme Machinery Co., Cleveland, Ohio.

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Garlock-Walker Mch. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.

Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.

Victor Tool Co., Waynesboro, Pa.

Bolt and Nut Machinery, Automatic
National Acme Co., Cleveland, Ohio.

Bolts and Nuts
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.

Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Bolt Threading Die Heads
Jones & Lamson Machine Co., Springfield, Vermont.

Landis Machine Co., Inc., Waynesboro, Pa.

Boosters
Sturtevant Co., B. F., Boston, Mass.

Boring and Turning Mills, Vertical
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Garlock-Walker Mch. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.

Herbert Ltd., Alfred, Toronto, Ont.

Boring, Drilling and Milling Machines, Horizontal
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Canada Machinery Corp., Galt, Ont.

Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.

Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

Langs Tool Co., Waynesboro, Pa.

Boring, Drilling and Milling Mach., Vertical
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.

Canada Machinery Corp., Galt, Ont.

Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.

Herbert Ltd., Alfred, Toronto, Ont.

McDougal Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Petrie, Ltd., H. W., Toronto, Ont.

Boring Heads
Aikenhead Hardware Ltd., Toronto, Ont.

Boring Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.

Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

Brakes, Magnetic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Brass
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Ontario Metal Products Co., Ltd., Toronto, Ont.

Brass Valves
Puro Sanitary Drinking Fountain Co., Bayville, Mass.

Brass Pipe Fittings
Puro Sanitary Drinking Fountain Co., Bayville, Mass.

Bricks, Fire
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

Bridges
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.

MacKinnon Steel Co., Sherbrooke, Que.

Broaching Machines
Bilton Machine Co., Bridgeport, Conn.

Garlock-Walker Mch. Co., Toronto, Ont.

Bronze
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Walker & Sons Metal Products Ltd., Hiram, Walkerville, Ont.

Ontario Metal Products Co., Ltd., Toronto, Ont.

Bronze, Phosphor
British Smelting & Refining Co., Ltd., Montreal, Que.

Canada Metal Co., Ltd., Toronto, Ont.

Ontario Metal Products Co., Ltd., Toronto, Ont.

Bucket Carriers, Pivoted
Can. Link-Belt Co., Toronto, Ont.

Buffing or Polishing Machines
(See Polishing and Buffing Machines)

Blount Co., J. G., Everett, Mass.
Car Hanson & Van Winkle Co., Ltd., Toronto, Ont.

Ford-Smith Machine Co., Hamilton, Ont.

Petrie, Ltd., H. W., Toronto, Ont.

U.S. Electrical Tool Co., Cincinnati, O.

Buildozers
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Canada Machinery Corp., Galt, Ont.

Garlock-Walker Mch. Co., Toronto, Ont.

Burners, Oil and Gas
General Combustion Co. of Can., Ltd., Montreal, Que.

W. S., New York City.

Bushings
Fisher Motor Co., Ltd., Orillia, Ont.

Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Cabinets, Oil
S. F. Bowser & Co., Ltd., Toronto, Ont.

Calipers
Brown & Sharpe Mfg. Co., Providence, R.I.

Starrett Co., I. S., Athol, Mass.

Cams
Canada Foundries & Forgings Co., Welland, Ont.

Can-Making Machinery (See Sheet Metal Working Machinery)

Ross Co., E. W., Brooklyn, N.Y.

Brown, Boggs & Co., Ltd., Hamilton, Ont.

MacKinnon Steel Co., Sherbrooke, Que.

BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

Cars, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Castings, Aluminum

Canada Electric Castings Co., Ltd., Orillia, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Brass and Bronze

Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Copper

Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Marine

Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Castings, Die Molded

Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Ferro-Alloy

Can. Steel Foundries, Montreal, Que.

Castings, Iron

Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia, Ont.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Castings, Hyd. Press

Can. Steel Foundries, Montreal, Que.

Castings, Monel Metal

Can. Driver-Harris Co., Ltd., Walkerville, Ont.

Castings, Naval Bronze

Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Nichrome

Can. Driver-Harris Co., Walkerville, Ont.

Castings, Nickel

Can. Hanson & Van Winkle Co., Toronto, Ont.

Castings, Semi-Steel

Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

Castings, Steel

Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

Cements, Iron

Smooth Mfg. Co., Jersey City, N.J.

Centering Machines

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.

Chains (See Sprockets and Chains)

Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio

Chains, Driving

Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glasco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio

Chasers

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chemists

Toronto Testing Laboratory, Toronto, Ont.

Clamping Machines

Acme Machine Tool Co., Cincinnati, Ohio

Brown & Sharpe Mfg. Co., Providence, R.I.

Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Chucks, Drill

Jacobs Mfg. Co., Hartford, Conn.

Chucks, Drill and Tap

Alkenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morris Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Lathe

Alkenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Magnetic

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chucks, Planer

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Chucks, Vertical Boring Mill

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Clamps, Machinists'

Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Cleaners, Metal, Waste, General

Oakley Chemical Co., New York, N.Y.

Clocks, Time

Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Clutches, Friction

Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

Coal and Ash Handling Machinery

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Coal-Storage Systems

Can. Link-Belt Co., Toronto, Ont.

Cocks and Faucets

Puro Sanitary Drinking Fountains Co., Haverhill, Mass.

Collars, Shaft or Set

Canada Foundries & Forgings Co., Welland, Ont.

Can. Link-Belt Co., Toronto, Ont.

Collets

Ackworth Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Compounds, Carburetizing, Case Hardening and Tempering

Catacrat Refining Co., Toronto, Ont.

Compounds, Cleaning

Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Compounds, Cutting, Drilling, Grinding, Screw Cutting

Atkins & Co., Inc., E. C., Indianapolis, I.
Catacrat Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Compressors, Air

Curtis Pneumatic Machinery Co., St. Louis, Mo.

Compressors, Air and Gas

Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mch. Co., Toronto, Ont.

Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Cones, Friction

Norton Co. of Can., Ltd., Hamilton, Ont.

Connecting Rods and Straps

Canada Foundries & Forgings Co., Welland, Ont.

Contract Work

Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

Conveyors and Elevators (See Elevators)

Jones & Glasco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

Conveyor Belt Joiners

Flexible Steel Lacing Co., Chicago, Ill.

Copper

Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Cored Bronze Bars

Tallman Brass & Metal, Ltd., Hamilton, Ont.

Cotter Pins

Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Counterbores

Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Counters, Revolution

Alkenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Countershafts

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.

Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempshall Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

Countersinks

Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Couplers, Car and Locomotive

Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Couplings, Flexible

Holden Co., Ltd., Montreal, Que.

Couplings, Rigid

Bernard Industrial Co., A., Fortierville, Que.

Couplings, Shaft

Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

Cranes, Electric

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montreal Falls, N.Y.

Cranes, Hand (See Hoists, Hand)

Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

Cranes, Locomotive

Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Cranes, Traveling

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Crank Pin Turning Machines

Garlock-Walker Mch. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., E. B., Philadelphia, Pa.

Cutters, Flue

Holden Co., Ltd., Montreal, Que.

Cutters, Gear

Armstrong-Whitworth Co. of Canada, Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, High Speed

Armstrong-Whitworth Co. of Canada, Ltd., Montreal, Canada.

Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Milling

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland, Ohio.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

Cutters, Stay Bolt

Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Thread

Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

Cutting-Off Machines

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mch. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)

Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Cutting-Off Tools

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

Cutting Oil Filters (See Oil Filtering Systems)

Bowser, S. F., & Co., Ltd., Toronto, Can.
Catacrat Refining Co., Toronto, Ont.

Cutting, Oxy-Acetylene

Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Cutting, Oxy-Hydrogen

National Electro Products, Ltd., Toronto, Ont.

Dealers, Machinery (See Searchlight Section)

Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Deckle Straps

Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Diamonds, Black and Rough

Joyce-Koebel Co., Inc., New York, N.Y.

Diamond, Carbon and Bortz

Joyce-Koebel Co., Inc., New York, N.Y.

Diamond Tools

Alkenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

Diamond Crossings

Can. Steel Foundries, Montreal, Que.

Die-Castings

Tallman Brass & Metal, Ltd., Hamilton, Ont.

Dies, Pipe-Threading

Jones & Lamson Machine Co., Springfield, Vt.

Die Sinking Machines, Automatic

Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

Die Sinkers

Kimber & Hillier, St. Catharines, Ont.

Dies, Screw and Thread Cutting

Ackworth Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

Dies, Sheet-Metal and Sub-Press (See Tool Work)

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

BUYERS' DIRECTORY

Dies, Forging

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

Dies, Hammer

Kimber & Hillier, St. Catharines, Ont.

Dies, Self-Opening, Adjustable

Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Dies, Threading-Opening

Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Disc Cement

Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Dividing Heads

Ackworth, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Dogs, Lathe and Milling Machine

Armstrong Bros. Tool Co., Chicago, Ill.

Drafting Boards and Tables

Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Drafting Materials

American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Dressers, Grinding Wheel

Dom Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebe Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy Co., Grand Rapids, Mich.

Drill Holders

Armstrong Bros. Tool Co., Chicago, Ill.

Drill Rods

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Alkenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Drill Speeders

Canada Machinery Corp., Galt, Ont.

Drilling Machine Heads

Henry & Wright Mfg. Co., Hartford, Conn.
Hoefler Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

Drilling Machines, Automatic

Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

Drilling Machines, Bench

Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Electric and Hand

Alkenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Gang

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mch. Co., Toronto, Ont.
Hoefler Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Drilling Machines, Heavy Duty
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Multiple Spindle

Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefler Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.

Drilling Machines, Pneumatic

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Drilling Machines, Portable

Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Radial

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mch. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Drilling Machines, Sensitive

Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Turret

Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

Drilling Machines, Vertical

Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefler Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougal Co., Ltd., R. Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Windsor Co. of Can., Ltd., Chas. A., Windsor, Ont.

Drills, Center

Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drills, High Speed Twist

Armstrong-Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mch. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

Drills, Ratchet

Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Drills, Twist and Flat

Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

Dust Handling Equipment

Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Electrical Instruments

Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

Electrical Supplies

Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

Elevating Trucks (See Trucks)

Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Elevators and Conveyors

Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

Emery Wheels (See Grinding Wheels)

Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Walsham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

Engines, Capstan

Kennedy & Sons, Wm., Owen Sound, Ont.

Engines, Mechanical

Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

Expanders, Tube

Garlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Eyeglasses, Safety (See Goggles, Safety)

Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

Fans, Electric

Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Fans, Exhaust

Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Fans, Ventilating

Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Fibre

Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

File Handles

Ingersoll File Co., Ltd., Ingersoll, Ont.

Files and Rasps

Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

Filing Machines

Garlock-Walker Mch. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Filler, Iron (See Cements, Iron)

Smooth Mfg. Co., Jersey City, N.J.

Fire Extinguishers

Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Fittings, Pipe

International Malleable Iron Co., Guelph, Ont.

Flexible Shafts

Alkenhead Hardware Ltd., Toronto, Ont.

Flux, Galvanizing

British Smelting & Refining Co., Ltd., Montreal, Que.

Fluxes, Welding

L'Air Liquide Society, Toronto, Ont.

Forging Machinery

Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

Forgings, Drop

Canada Foundries & Forgings Co., W. land, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

Forgings, Hammer

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., W. land, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co. Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Foundry Equipment

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougal Co., Ltd., R. Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Foundry Supplies

Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Frogs, Spring or Rigid

Can. Steel Foundries, Montreal, Que.

Fuel Oil Burning System

General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Electric

Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.
Furnaces, Heat Treating Coal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City

Furnaces, Heat Treating Oil and Gas

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Furnaces, Heat Treating Oil and Gas

Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces and Ovens, Electric

Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces, Tempering and Annealing

Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furniture, Machine Shop

Garlock-Walker Mch. Co., Toronto, Ont.

Gages, Comparator

Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

Gages, Measuring (See Tool Work)

Chesterman & Co., Ltd., J. Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

Gages, Recording

Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

BUYERS' DIRECTORY

Gages, Snap, Thread and Cylindrical
Ackworth, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Gages, Special Measuring (See Tool Work)
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Gages, Standard
Armstrong Whitworth Co. of Can., Ltd.,
Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Johansson Inc., C. E., Windsor, Ont.

Gages, Thread
Ackworth, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

Garnet, Emery and Flint Paper and Cloth
Ritchey Supply Co., Toronto, Ont.

Gas, Coal Compressed
L'Air Liquide Society, Toronto, Ont.

Gas, Compressed
Prest-O-Lite Co. of Can., Toronto, Ont.

Gaskets
Diamond State Fibre Co. of Can., Ltd.,
Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd.,
Toronto, Ont.
Goodyear Tire & Rubber Co. of Can.,
Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

Gear Blanks
Canada Foundries & Forgings Co., Wel-
land, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd.,
Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto
Ontario.
Philadelphia Gear Works, Philadelphia,
Pa.

Gear-Cutting Machines
Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whitton Machine Co., D. E., New London,
Conn.

Gear Testing Machines
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.

Gears, Cast
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

Gears, Cut
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd.,
Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto,
Ontario.
Heppburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glasco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDonnell Co., Ltd., R. E., Galt, Ont.
Philadelphia Gear Works, Philadelphia,
Pa.
Renold (Hans) of Canada, Ltd., Mont-
real, Que.

Gears, Dressed
Kennedy & Sons, Wm., Owen Sound, Ont.

Gears, Forged
Canada Foundries & Forgings Co., Wel-
land, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Gears, Herringbone
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto,
Ont.
Philadelphia Gear Works, Philadelphia,
Pa.

Gears, Machine Moulded
Can. Steel Foundries, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal,
Quebec

Gears, Worm
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto,
Ontario.
Generators, Acetylene
L'Air Liquide Society, Toronto, Ont.

Generators, Electric
Holden Co., Ltd., Montreal, Que.

Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Goggles, Safety
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

Grab Buckets
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara
Falls, Ont.

Grease Cups, Pressed Steel and Brass
Can. Winkley Co., Ltd., Windsor, Ont.

Greases, Lubricating
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

Grinding Discs
Ritchey Supply Co., Toronto, Ont.

Grinding Machines
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal

Grinding Machines, Abrasive Belt
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Automatic
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Grinding Machines, Bench
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New
Bedford, Mass.
McDonnell Co., Ltd., R. E., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.
Rockford Drilling Machine Co., Rockford,
Ill.
Roelefsen Machine & Tool Co., Toronto,
Ont.
Waltham Grinding Wheel Co. of Canada,
Brantford, Ont.

Grinding Machines, Center
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Chaser
Jones & Lamson Machine Co., Spring-
field, Vt.

Grinding Machines, Cutter and Reamer
Cincinnati Milling Machine Co., Cincin-
nati, Ohio.
Garlock-Walker Mch. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Grinding Machines, Cylindrical
Garlock-Walker Mch. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Grinding Machines, Die
Jones & Lamson Machine Co., Springfield,
Vermont.
Murphy Machine & Tool Co., Detroit,
Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

Grinding Machines, Disc
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Drill
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Face
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Floor and Tool
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Grinding Machines, Internal
Garlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Portable
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Cincinnati Electrical Tool Co., Cincinnati,
Ohio.
Cleveland Pneumatic Tool Co., Toronto,
Ont.

Garlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Power Oscillating Tool
Herbert Ltd., Alfred, Toronto, Ont.

Grinding Machines, Ring Wheel
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Snagging
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Surface
Garlock-Walker Mch. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Grinding Machines, Thread
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Grinding Machinery, Tool Post
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Universal
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Garlock-Walker Mch. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New
Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefsen Machine & Tool Co., Toronto,
Ont.
Waltham Grinding Wheel Co. of Canada,
Brantford, Ont.

Grinding Wheels
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Dom. Abrasive Wheel Co., Ltd., Mimico,
Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada,
Ltd., Brantford, Ont.

Guards, Emery Wheel
Ford-Smith Machine Co., Hamilton, Ont.

Guards, Machinery and Window
Can. Wire & Iron Goods Co., Hamilton,
Ont.

Guards, Electric Lamp
Flexible Steel Lacing Co., Chicago, Ill.

Gun-Barrel Machinery
Steinle Turret Machine Co., Madison, Wis.

Hack Saws, Power
Ackworth, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada
Garlock-Walker Mch. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R.,
Montreal, Que.

Hammers, Chipping
Cleveland Pneumatic Tool Co., Toronto,
Ont.

Hammers, Drop
Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Rogers & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Wel-
land, Ont.
Canada Machinery Corp., Galt, Ont.

Hammers, Electric
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Rogers & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Hammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.
Cleveland Pneumatic Tool Co., Toronto,
Ont.

Garlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand
Haven, Mich.

Hammers, Power
Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Brown, Rogers & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hammers, Rivetting
Cleveland Pneumatic Tool Co., Toronto,
Ont.

Hangers, Shafting
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co.,
Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R.,
Montreal, Que.

**Hardening, Case-Hardening and Tem-
pering**
Hamilton Gear & Machine Co., Toronto,
Ont.

Hardness Testing Apparatus
Shore Instrument Co., Jamaica, N.Y.

Heating
Skinner Bros. Mfg. Co., Inc., St. Louis,
Mo.

Hobbing Machines
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hobs
Armstrong-Whitworth of Canada, Ltd.,
Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Holts, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara
Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co.,
Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

Holts, Hand
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara
Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Holts, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Curtis Pneumatic Machinery Co., St.
Louis, Mo.
Garlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara
Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Holders-On, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Cleveland Pneumatic Tool Co., Toronto
Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Hose, Flexible Steel
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ontario Metal Products Co., Ltd., Tor-
onto, Ont.

Hose, Industrial
Dunlop Tire & Rubber Goods Co., Ltd.,
Toronto, Ont.
Goodyear Tire & Rubber Co. of Can.,
Ltd., Toronto, Ont.

Hose, Rubber
Can. Consolidated Rubber Co., Ltd.,
Montreal, Que.
Can. Foamite Firefoam Co., Hamilton,
Ont.

Hydraulic Leather
Graton & Knight Mfg. Co., Worcester,
Mass.

Hydraulic Machinery
Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Garlock-Walker Mch. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Sco.

Hydrogen
National Electro Products, Ltd., Toronto,
Ont.

Index Centers
Dickow, Fred C., Machinery Co., Chi-
cago, Ill.

Igniters, Gas Engine
Canada Foundries & Forgings Co., Wel-
land, Ont.

Indicators, Speed and Test
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

Insulation
Diamond State Fibre Co. of Can., Ltd.,
Toronto, Ont.

Iron Valves
Puro Sanitary Drinking Fountain Co.,
Haydenville, Mass.

Jacks, Hydraulic
Norton, A. O., Boston, Mass.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

BUYERS' DIRECTORY

Jigs and Fixtures (See Tool Work)
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Keyseating Machines

Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mch. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Keys, Machine

Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

Knives, Machine

Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

Knurl Holders

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lacing Leather

Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

Lamps, Electric

Federal Eng'g Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

Lathe Attachments

Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

Lathe Pans, Portable

Canada Machinery Corp., Galt, Ont.

Lathe Tools

Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

Lathes, Automatic and Semi-Automatic

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Bench

Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lathes, Boring

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)

Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Engine

Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mch. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefsen Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Extension and Gap

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Lathes, Heavy Duty Projectile Boring

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blashill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Williams Machinery & Supply Co., A. R. Measuring Machines

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Metals, Alloy

British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Metallite Cloth

Ritchey Supply Co., Toronto, Ont.

Micrometer Calipers

Alkenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

Milling Attachments

Ackworth, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kemp Smith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Milling Machines

Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

Milling Machines, Automatic

Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Bench

Burke Machine Tool Co., Conneaut, Ohio.
Garlock-Walker Mch. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Hand

Burke Machine Tool Co., Conneaut, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.

Milling Machines, Horizontal and Planer Type

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edmund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefsen Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Milling Machines, Plain

Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mch. Co., Toronto, Ont.
Gooley Edmund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kemp Smith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Thread

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Milling Machines, Universal

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kemp Smith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.

Roelefsen Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Milling Machines, Vertical

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mch. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kemp Smith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

Monel Metal

International Nickel Co. of Can., Ltd., Toronto, Ont.

Motors, Electric

Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.

Wisconsin Electric Co., Racine, Wis

Moulded Rubber Goods

Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Nail Machinery

Sleeper & Hartley, Inc., Worcester, Mass.

Nails and Staples

Steel Co. of Canada, Ltd., Hamilton, Ont.

Nickel, Bars, Sheets, Wire, Etc.

International Nickel Co. of Can., Ltd., Toronto, Ont.

Nickel Plating Outfits

Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Nickel Silver

Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Nitrogen

L'Air Liquide Society, Toronto, Ont.

Nut Tappers (See Bolt and Nut Machinery)

Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

Nuts, Finished and Semi-finished

Galt Machine Screw Co., Galt, Ont.

Nuts, Machine Screw

Torrington Company, Ltd., Upper Bedford, Que.

Nuts, S.A.E., Plain and Castellated

Galt Machine Screw Co., Galt, Ont.

Oil Cocks and Burners

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

Oil Filtering and Storage Systems

Bowser, S. F. & Co., Ltd., Toronto, Can.

Oil Storage Engineers

Bowser, S. F. & Co., Ltd., Toronto, Can.

Oils

Canadian Oil Companies, Ltd., Toronto, Ont.

Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Hole Covers

Can. Winklev Co., Ltd., Windsor, Ont.

Oils, Soluble

Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oxygen

Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

Oxy-Acetylene Apparatus

L'Air Liquide Society, Toronto, Ont.

Packing, Hydraulic

Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Graton & Knight Mfg. Co., Worcester, Mass.

Gulldford & Sons, L., Halifax, N.S.

Packing, Steam

Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Can. Fairbanks-Morse Co., Ltd., Montreal.

Graton & Knight Mfg. Co., Worcester, Mass.

Gulldford & Sons, Ltd., Halifax, N.S.

Paper Mill Conveyors

Bertrams Ltd., Edinburgh, Scotland.

Patents

Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

Pans, Wet and Dry

Frost Mfg. Co., Chicago, Ill.

Pattern-Shop Machinery (See Wood-working Machinery)
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Patterns, Wood and Metal
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggs Pattern Works, Galt, Ont.

Penstocks, Steel

MacKinnon Steel Co., Sherbrooke, Que.

BUYERS' DIRECTORY

Phosphor Tin
British Smelting & Refining Co., Ltd.
Montreal, Que.

Photographic Duplicating Machines
Commercial Camera Co., Providence, R.I.

Pig Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Bending Machines
American Pipe Bending Machine Co.,
Boston, Mass.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia,
Pa.
Williams Machinery Co., A. R., Toronto,
Ont.

Pipe Couplings
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Cutting and Threading Machines
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murphy Machine & Tool Co., Detroit,
Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brant-
ford, Ont.

Pipe and Nipple Threading Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Pipe Fitters' Tools
Alkenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Pipe Threading Die Heads
Landis Machine Co., Inc., Waynesboro, Pa.

Piston-Ring Machines
National Aime Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Planers, Parallels
L. & P. Mfg. Co., Niagara Falls, Ont.

Planing Machines
Bertram & Son Co., Ltd., The John
Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Garlock-Walker Mch. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto,
Ont.

Planing Machines, Rotary
Bertram & Son Co., Ltd., The John
Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

Plate Rolls
Bertram & Son Co., Ltd., The John
Dundas, Ont.

Plumbers' Brass Goods
Pub. Smith & Tinkler Foundry Co.,
Haverhill, Mass.

Pneumatic Tools
Can. Ingersoll-Rand Co., Ltd., Sher-
brooke, Que.
Cleveland Pneumatic Tool Co., Toronto,
Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand
Haven, Mich.

Polishing and Buffing Machines
Ackworth, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd.,
Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Pots, Steel
Svedish Crucible Steel Co. of Canada,
Ltd., Windsor, Ont.

Pressed Steel Parts
Ackworth, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
L. & P. Manufacturing Company, Ltd.,
Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A.,
Windsor, Ont.

Presses, Drop and Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Wel-
land, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Foot and Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

Presses, Forging
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

Presses, Hydraulic
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John
Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Presses, Mfg. Co., Springfield, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto,
Ont.

Presses, Power

Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Screw

Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Profiling Machines

Alkenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Protractors

Brown & Sharpe Mfg. Co., Providence, R.I.

Propellers

Kennedy & Sons, Wm., Owen Sound, Ont.

Pulleys, Cork Insert

American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Positive Clutch & Pulley Works, Toronto,
Ont.

Pulleys, Metal and Fibre

American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville,
Que.
Can. Fairbanks-Morse Ltd., Montreal Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd.,
Toronto, Ont.
Johnson Machine Co., Carlyle, Manches-
ter, Conn.

Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R.,
Montreal, Que.

Pulp and Paper Mill Equipment
MacKinnon Steel Co., Sherbrooke, Que.

Pumps, Automobile Tire
Tallian Brass & Metal, Ltd., Hamilton,
Ont.

Pumps, Barrel and Boiler-feed
Trahern Pump Co., Rockford, Ill.

Pumps, Circulating and Coalant
Trahern Pump Co., Rockford, Ill.

Pumps, Geared and Hand
Trahern Pump Co., Rockford, Ill.

Pumps, Industrial
Trahern Pump Co., Rockford, Ill.

Pumps, Hydraulic
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.
Electric Steel & Engineering Co., Wel-
land, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

Pumps, Lubricant and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

Pumps, Power
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal Q.
Can. Ingersoll-Rand Co., Ltd., Sher-
brooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

Punches, Center
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

Punches, Power
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mch. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

Punching Machines, Horizontal
Bertrams Ltd., Edinburgh, Scotland.

Pyrometers, Electric
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd.,
Montreal, Que.
Walker & Sons Metal Products, Ltd.,
Hiram, Walkerville, Ont.

Racks, Cut
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto,
Ont.

**Racks, Storage (See Furniture,
Machine Shop)**
Brantford Oven & Rack Co., Brantford,
Ont.

Rammers, Foundry
Holden Co., Ltd., Montreal, Que.

Reamer Holders
Cleveland Twist Drill Co., Cleveland, O.

Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

Reamers, Expanding

Alkenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walker-
ville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd.,
Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Reamers, Solid

Armstrong Whitworth Co. of Can., Ltd.,
Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walker-
ville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd.,
Ingersoll, Ont.
Morse Twist Drill & Machine Co., New
Bedford, Mass.

Reamers, Taper

Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walker-
ville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Garlock-Walker Mch. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd.,
Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John,
Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Recorders, Temperature

Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd.,
Hiram, Walkerville, Ont.

Recorders, Time

Gisholt Machine Co., Madison, Wis.
International Business Machines Co., To-
ronto, Ont.

**Regulators, Automatic (for electric
furnaces)**
Volta Mfg. Co., Welland, Ont.

Rheostats

Northern Electric Co., Montreal, Que.

Resistance Materials

Walker & Sons Metal Products, Ltd.,
Hiram, Walkerville, Ont.

Respirators

Willson Goggles, Inc., Reading, Pa.

Rivets

Parmenter & Bulloch Co., Gananoque,
Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bed-
ford, Que.

Rivet Heaters

Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.
General Combustion Co. of Can., Ltd.,
Montreal, Que.
Volta Mfg. Co., Welland, Ont.

Rivet-Making Machinery

Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John,
Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

Riveting Machines

Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven,
Mich.

Parmenter & Bulloch Co., Gananoque,
Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

Rolling Mill Equipment

Stewart & Co., Duncan, Glasgow, Scot.

Rolls (Rubber Covered)

Can. Consolidated Rubber Co., Ltd.,
Montreal, Que.

Rodder Frames, Steel

Can. Steel Foundries, Montreal, Que.
Domino Foundries & Steel, Ltd., Ham-
ilton, Ont.

Rubber Goods, Mechanical

Quaker City Rubber Co., Philadelphia, Pa.

Rules, Steel

Chesterman & Co., Ltd., J., Sheffield, Eng.

Rules, Steel and Wood

Brown & Sharpe Mfg. Co., Providence, R.I.

Rust Preventatives

Oakley Chemical Co., New York, N.Y.

Sand Equipment

Can. Link-Belt Co., Toronto, Ont.

Sand Mills

Frost Mfg. Co., Chicago, Ill.

Sanding Machinery

Oliver Machy. Co., Grand Rapids, Mich.

Sand Rammers, Pneumatic

Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.
Cleveland Pneumatic Tool Co., Toronto,
Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven,
Mich.

Saw Frames and Blades, Hack

Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Bur-
falo, N.Y.

Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

Sawing Machines, Metal

Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Sawing Machines, Power Hack

Ackworth, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R.,
Montreal, Que.

Saw Sharpening Machines

Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saw Tables, Universal

Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Saws, Circular Metal

Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hand

Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

Saws, Hot and Cold

Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Saws, High Speed Steel

Armstrong-Whitworth of Canada, Ltd.,
Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Metal Band

Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saws, Metal, Power

Clemson Bros., Inc., Hamilton, Ont.

Saws, Metal Cutting

Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

Saws, Milling

Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd.,
Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Saws, Screw Slotting

Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Swing Cut-off

Oliver Machinery Co., Grand Rapids, Mich.

Scales

Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

Screens

Can. Wire & Iron Goods Co., Hamilton,
Ont.

**Screw Drivers, Optical, Jewelry and
Novelty**
Torrington Co., Ltd., Upper Bedford, Que.

Screw Driving Machine

Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Screw Extractors

Cleveland Twist Drill Co., Cleveland, O.

Screw Machine Work

Barnes Co., Wallace, Bristol, Conn.
Cook Co., Ass. S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton,
Ont.

BUYERS' DIRECTORY

Screw Machinery, Wood and Lag
Cook Co., Asa S., Hartford, Conn.

Screw Machines
Brown & Sharpe Mfg. Co., Providence, R. I.

Screw Machines, Automatic
Garlock-Walker Mch. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

Screw Machine Products
Torrington Company, Ltd., Upper Bedford, Que.

Screw Plates
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

Screws, Cap and Set
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Lock Cap
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Machine
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Safety Set
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Screws, Side Knob
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Thumb
Torrington Company, Ltd., Upper Bedford, Que.

Second-Hand Machinery
(See Searchlight Section)
Petrie, Ltd., H. W., Toronto, Ont.

Separators, Moisture and Oil
Rowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co. Ltd., Sherbrooke, Que.

Separators, Oil and Waste
Rowser, S. F., & Co., Ltd., Toronto, Can.

Shafting
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Shapes, Cold-Drawn Special Steel
Union Drawn Steel Co., Hamilton, Ont.

Shaping Machines
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R. Galt, Ont.
Roelofson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Shapers, Wood
Oliver Machinery Co., Grand Rapids, Mich.

Shears, Hand
Can. Blower & Forge Co., Ltd., Kitchener.

Shears, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
& Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

Shearing Machines, Angle, Iron Bar and Gate
Bertrams Ltd., Edinburgh, Scotland.

Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

Sheets, Nickel, Resist. Alloy
International Nickel Co. of Can., Ltd., Toronto, Ont.

Sheets, Nickel, Monel and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Side Frames, Locomotive
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Slotting Attachments
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kearney & Trecker Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

Slotting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

Solders
British Smelting & Refining Co. Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

Snap Flasks
Oliver Machy. Co., Grand Rapids, Mich.

Special Machinery and Tools
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Specialties, Swaged and Headed Work
Torrington Company, Ltd., Upper Bedford, Que.

Spectacles, Industrial
Willson Goggles, Inc., Reading, Pa.

Springs
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

Spring-making Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Sprockets and Chains
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Squares
Brown & Sharpe Mfg. Co., Providence, R. I.

Stamping, Metal
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Stamps, Steel
Diamond Saw & Stamping Works, Buffalo, N.Y.

Stairways, Wrought Iron
Can. Wire & Iron Goods Co., Hamilton, Ont.

Steam Specialties
Crane Ltd., Montreal, Que.

Steel Plate
Dom. Foundries & Steel, Hamilton, Ont.

Steels, Tool
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Alliquippa, Pa.

Steel Blooms and Billets
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steel, Cold-Rolled Strip
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Steel Castings
Dom. Foundries & Steel, Hamilton, Ont.

Steel Forgings
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Steel, Shafting and Free Cutting
Screw
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

Steel, Sheet
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

Steel, Tanks
Can. John Wood Mfg. Co., Toronto, Ont.

Steel, Stainless
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel Wire Rods
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steels, Alloy, Open Hearth and Electric
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

Steels, Alloy and Carbon
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.

Andrew Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Alliquippa, Pa.

Steels, High-Speed
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Alliquippa, Pa.

Steel, Magnet
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel, Structural
MacKinnon Steel Co., Sherbrooke, Que.

Steel Tubing, Close Joint and Welded
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

Stern Frames, Cast Steel
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Straitening Machinery
Bertrams Ltd., Edinburgh, Scotland.

Studs
Galt Machine Screw Co., Galt, Ont.

Surface Plates
Bilton Machine Co., Bridgeport, Conn.

Swaging Machines
Atkins & Co., Inc., E. C., Indianapolis, Ind.

Switches, Railway
Can. Steel Foundries, Montreal, Que.

Switches and Switchboards
Northern Electric Co., Montreal, Que.

Tablets, Bronze, Memorial
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Tachometers
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

Tanks, Steel
MacKinnon Steel Co., Sherbrooke, Que.

Tanks and Pumps, Oil
Rowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

Taper Cutting Dies
Jones & Lamson Machine Co., Springfield, Vt.

Tap Holders
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taper Pins
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Tapes, Measuring
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

Tapping Machines and Attachments
Ackworth, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Taps and Dies
Ackworth, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.

Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.

Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taps, Collapsing
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

Teeth, Dredge Bucket
Kennedy & Sons, Wm., Owen Sound, Ont.

Testing Metals and Materials
Toronto Testing Laboratory, Toronto, Ont.

Thermometers
Bristol Co., Waterbury, Conn.

Thread-Cutting Tools
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Thread Cutting Machines
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

Threaded Wires
Torrington Company, Ltd., Upper Bedford, Que.

Threading Machines
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Thread Lead Testing Machines
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Thread-Rolling Machines
Bliss Co., E. W., Brooklyn, N.Y.

Tongs
Hepburn Ltd., John T., Toronto, Ont.

Tool Cases
Rice Lewis & Son, Ltd., Toronto, Ont.

Tool Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Markers, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Tool Posts, Lathe
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Steels for all Purposes
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Tools, Small (See Machinists' Small Tools)
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Chesterman & Co., Ltd., J., Sheffield, Eng.

Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Leasing Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Starrett Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Truening Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Tool Work
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

Torches, Blow

National Electro Products, Ltd., Toronto Ont.
 Perdue, W. B., San Francisco, Calif.
 Prest-O-Lite Co. of Can., Toronto, Ont.
 Rice Lewis & Son, Ltd., Toronto, Ont.

Trackwork, Railway

Can. Steel Foundries, Montreal, Que.

Trackwork, Manganese Steel

Can. Steel Foundries, Montreal, Que.

Transformers

Northern Electric Co., Montreal, Que.

Transmission Machinery

Bernard Industrial Co., A., Fortierville, Que.
 Can. Link-Belt Co., Toronto, Ont.
 Garlock-Walker Mch. Co., Toronto, Ont.
 Jones & Glasco, Montreal, Que.
 Kennedy & Sons, Wm., Owen Sound, Ont.
 Petrie, Ltd., H. W., Toronto, Ont.
 Positive Clutch & Pulley Works, Toronto, Ont.
 Renold (Hans) of Canada, Ltd., Montreal, Que.

Transportation Systems (See Trucks)

Mathews Gravity Carrier Co., Port Hope, Ont.

Treated Bits

Can. Atlas Crucible Steel Co., Toronto Ont.
 Vanadium Alloys Steel, Latrobe, Pa.

Trolleys and Tramways

Can. Link-Belt Co., Toronto, Ont.
 Morris Crane & Holst Co., Ltd., Niagara Falls, Ont.
 Northern Crane Works, Walkerville, Ont.
 Wright Mfg. Co., Lisbon, Ohio.

Trucks

Can. Fairbanks-Morse Ltd., Montreal Q.
 Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
 Hepburn Ltd., John T., Toronto, Ont.
 Maple Leaf Mfg. Co., Montreal, Que.
 Morris Crane & Holst Co., Ltd., Niagara Falls, Ont.
 National Steel Car Corp., Ltd., Hamilton, Ont.

Trucks, Industrial Motor

Maple Leaf Mfg. Co., Montreal, Que.
 National Steel Car Corp., Ltd., Hamilton, Ont.

Tube, Products

Tube Co. of Canada, Toronto, Ont.

Tubing, Electric Welded or Oxy-Acetylene Welded

Tube Co. of Canada, Toronto, Ont.

Tubing, Flexible

Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
 Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Tubing, Seamless Steel

Tube Co. of Canada, Toronto, Ont.

Tubing, Seamless Steel, Brass and Copper and Fibre

Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
 Dom. Steel Products Co., Brantford, Ont.
 Lyman Tube & Supply Co., Montreal, Que.
 Ontario Metal Products Co., Ltd., Toronto, Ont.
 Tallman Brass & Metal Co., Hamilton, Ont.

Tubing, Welded

International Nickel Co. of Can., Ltd., Toronto, Ont.
 Ontario Metal Products Co., Ltd., Toronto, Ont.

Tubing, Welded Steel

Tube Co. of Canada, Toronto, Ont.

Turbines, Water

Kennedy & Sons, Wm., Owen Sound, Ont.

Turret Heads

Ackworth, Ltd., John, Birmingham, Eng.
 Bertram & Son Co., Ltd., The John, Dundas, Ont.

Turret Machines (See Lathes, Horizontal Turret)

Acme Machine Tool Co., Cincinnati, Ohio
 Cook Co., Asa S., Hartford, Conn.
 Gisholt Machine Co., Madison, Wis.
 Jones & Lamson Machine Co., Springfield, Vermont.

National Acme Co., Cleveland, Ohio

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Steinle Turret Machine Co., Madison, Wis.

Warner & Swasey Co., Cleveland, Ohio

Turrets, Tool Post

Gisholt Machine Co., Madison, Wis.

Unions, Pipe

Crane Ltd., Montreal, Que.

Universal Joints

Ford-Smith Machine Co., Hamilton, Ont.
 Holden Co., Ltd., Montreal, Que.

BUYERS' DIRECTORY**Valves**

Can. Fairbanks-Morse Ltd., Montreal, Q.
 Cleveland Pneumatic Tool Co., Toronto, Ont.

Crane Ltd., Montreal, Que.

Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.

Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Vises, Drilling Machine

Hoosier Drilling Mach. Co., Goshen, Ind.

Kemp Smith Mfg. Co., Milwaukee, Wis.

Vises, Metal Workers'

Alkenhead Hardware, Ltd., Toronto, Ont.

Columbia Hdwe. Division, Cleveland, O.

Vises, Milling Machine

Brown & Sharpe Mfg. Co., Providence, R.I.

Crescent Machine Co., Ltd., Montreal, Q.

Ford-Smith Machine Co., Hamilton, Ont.

Hendey Machine Co., Torrington, Conn.

Hoosier Drilling Mach. Co., Goshen, Ind.

Kearney & Trecker Co., Milwaukee, Wis.

Kemp Smith Mfg. Co., Milwaukee, Wis.

Victor Tool Co., Waynesboro, Pa.

Parmenter & Bulloch Co., Gananoque, Ont.

Voltmeters

Bristol Co., Waterbury, Conn.

Northern Electric Co., Montreal, Que.

Wagon Leaders

Can. Link-Belt Co., Toronto, Ont.

Washers

Barnes Co., Wallace, Bristol, Conn.

Diamond State Fibre Co., Toronto, Ont.

Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.

Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Graton & Knight Mfg. Co., Worcester, Mass.

McLaren Belting Co., J. C., Montreal, Que.

Steel Co. of Canada, Ltd., Hamilton, Ont.

Torrington Company, Ltd., Upper Bel-
 ford, Que.

DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que.

The Canadian Fairbanks-Morse Co., Montreal, Que.

The Garlock-Walker Machinery Co., Toronto, Ont.

R. S. Holly, Toronto, Ont.

H. W. Petrie Limited, Toronto, Ont.

The Standard Equipment & Tool Co., Montreal, Que.

Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.

A. R. Williams Machinery Co., Toronto, Ont.

A. R. Williams Machinery Co., Montreal, Que.

Wilson-McGovern Limited, Toronto, Ont.

Yeates Machinery Co., London, Ont.

MACHINE SHOP AND FACTORY SUPPLIES

Chas. P. Archibald & Co., Montreal, Que.

The Canadian Fairbanks-Morse Co., Montreal, Que.

The Garlock-Walker Machinery Co., Toronto, Ont.

R. S. Holly, Toronto, Ont.

H. W. Petrie Limited, Toronto, Ont.

The Standard Equipment & Tool Co., Montreal, Que.

Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.

A. R. Williams Machinery Co., Toronto, Ont.

A. R. Williams Machinery Co., Montreal, Que.

Wilson-McGovern Limited, Toronto, Ont.

Yeates Machinery Co., London, Ont.

POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co., Montreal, Que.

MacGovern & Co., Montreal, Que.

H. W. Petrie Limited, Toronto, Ont.

The Standard Equipment & Tool Co., Montreal, Que.

Wilson-McGovern Limited, Toronto, Ont.

A. R. Williams Machinery Co., Montreal, Que.

WOODWORKING MACHINERY

Chas. P. Archibald & Co., Montreal, Que.

The Canadian Fairbanks-Morse Co., Montreal, Que.

The Garlock-Walker Machinery Co., Toronto, Ont.

R. S. Holly, Toronto, Ont.

H. W. Petrie Limited, Toronto, Ont.

Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.

A. R. Williams Machinery Co., Toronto, Ont.

A. R. Williams Machinery Co., Montreal, Que.

Yeates Machinery Co., London, Ont.

Vises, Pipe

Columbia Hdwe. Division, Cleveland, O.

Greenfield Tap & Die Corp., Galt, Ont.

Vises, Planer and Shaper

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Hendey Machine Co., Torrington, Conn.

Hoosier Drilling Mach. Co., Goshen, Ind.

Kemp Smith Mfg. Co., Milwaukee, Wis.

McDougall Co., Ltd., R., Galt, Ont.

Superior Machine Co., London, Ont.

Vises, Wood Workers'

Columbia Hdwe. Division, Cleveland, O.

Foss Machinery & Supply Co., Geo. F., Montreal, Que.

Oliver Machy. Co., Grand Rapids, Mich.

Washers, Rubber

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Welding Apparatus, Oxy-Acetylene

L'Air Liquide Society, Toronto, Ont.

Welding, Electric

All-Weld Company, Toronto, Ont.

Carter Welding Co., Toronto, Ont.

Lincoln Electric Co., Toronto, Ont.

National Electro Products, Toronto, Ont.

Welding Filler Rods

L'Air Liquide Society, Toronto, Ont.

National Electro Products, Ltd., Toronto, Ont.

Perdue, W. B., San Francisco, Calif.

Prest-O-Lite Co. of Can., Toronto, Ont.

Welding Machines, Oxy-Acetylene

Davis-Bourmonville Co., Jersey City, N.J.

Holden Co., Ltd., Montreal, Que.

L'Air Liquide Society, Toronto, Ont.

Perdue, W. B., San Francisco, Calif.

Prest-O-Lite Co. of Can., Toronto, Ont.

Welding, Oxy-Acetylene

Carter Welding Co., Toronto, Ont.

Davis-Bourmonville Co., Jersey City, N.J.

Holden Co., Ltd., Montreal, Que.

Lincoln Electric Co., Toronto, Ont.

National Electro Products, Toronto, Ont.

Prest-O-Lite Co. of Can., Toronto, Ont.

Union Carbide Co. of Can., Welland, Ont.

Welding Rod, Tobin, Manganese Bronze and Aluminum

Tallman Brass & Metal, Ltd., Hamilton, Ont.

Welding Supplies

British Smelting & Refining Co., Ltd., Montreal, Que.

Carter Welding Co., Toronto, Ont.

Davis-Bourmonville Co., Jersey City, N.J.

L'Air Liquide Society, Toronto, Ont.

Lincoln Electric Co., Toronto, Ont.

National Electro Products, Toronto, Ont.

Perdue, W. B., San Francisco, Calif.

Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.

Union Carbide Co. of Can., Welland, Ont.

Wheels, Cast, Steel

Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Wheels, Industrial

American Pulley Co., Philadelphia, Pa.

Hull Iron & Steel Foundries, Hull, Que.

Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Electric

Shepard Electric Crane & Holst Co., Montreal, N.Y.

Volta Mfg. Co., Welland, Ont.

Winches, Headgate

Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Stoplog

Kennedy & Sons, Wm., Owen Sound, Ont.

Wire

Barnes Co., Wallace, Bristol, Conn.

Canada Metal Co., Ltd., Toronto, Ont.

Dennis Wire & Iron Works, London, Ont.

Greening Wire Co., B., Hamilton, Ont.

Northern Electric Co., Montreal, Que.

Wire Cloth

Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Coiling Machinery

Sleeper & Hartley, Inc., Worcester, Mass.

Wire Rope

Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Straightening and Cutting Machinery

Baird Machine Co., Bridgeport, Conn.

Brown, Boggs & Co., Ltd., Hamilton, Ont.

Schuster Co., F. B., New Haven, Conn.

Sleeper & Hartley, Inc., Worcester, Mass.

Wire, Welding

L'Air Liquide Society, Toronto, Ont.

National Electro Products, Ltd., Toronto, Ont.

Perdue, W. B., San Francisco, Calif.

Prest-O-Lite Co. of Can., Toronto, Ont.

Tallman Brass & Metal Co., Hamilton, Ont.

Wires, Special

Dennis Wire & Iron Works, London, Ont.

Greening Wire Co., B., Hamilton, Ont.

Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Woodworking Machinery

Canada Machinery Corp., Galt, Ont.

Can. Fairbanks-Morse Co., Ltd., Montreal, Ont.

Garlock-Walker Mch. Co., Toronto, Ont.

Oliver Machinery Co., Grand Rapids, Mich.

Williams Machinery Co., A. R., Toronto, Ont.

Wrenches, Drop Forged

Armstrong Bros. Tool Co., Chicago, Ill.

Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Machinists'

Armstrong Bros. Tool Co., Chicago, Ill.

Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Pipe

Canada Foundries & Forgings Co., Welland, Ont.

Crane Ltd., Montreal, Que.

Greenfield Tap & Die Corp., Galt, Ont.

Wrenches, Tap

Butterfield & Co., Inc., Rock Island, Que.

Greenfield Tap & Die Corp., Galt, Ont.

Wrought Iron Pipe

Steel Co. of Canada, Ltd., Hamilton, Ont.

CANADIAN MACHINERY AND MANUFACTURING NEWS

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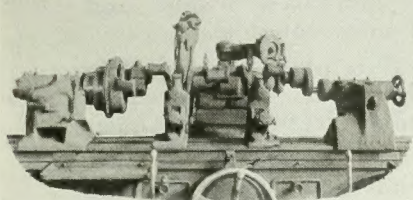
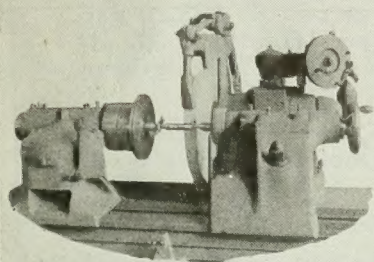
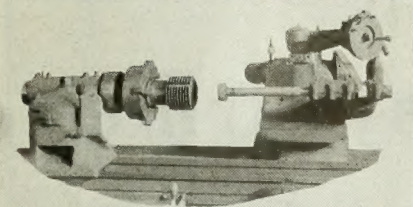
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And Now— Toronto Printers May Strike

THE present agreement between printers in book and job offices and employers in Toronto expires May 31. The minimum wage paid is \$35.20 per week (increased voluntarily a year ago by the employers from \$32.00, although the agreement had a year then to run). This wage covers a 48-hour week.

The International Union is demanding a week of 44 hours as the basis for all wage scales, and the Toronto unions are demanding a wage of \$44.00 per week of 44 hours, \$8.80 more per week for 4 hours less work.

This means an increase of from 73 cents per hour to \$1.00 per hour, or over 36%.

Publishers and other employing printers feel that under present conditions of business and the admitted decreasing cost of living, the increased wages and shorter hours demanded by the International Union are unreasonable.

This is acknowledged by many of the thoughtful and loyal printers employed in the Toronto offices, who believe that the International Union has blundered in its demand that local unions shall not sign new agreements except on the basis of the 44-hour week.

The position, however, may be that these local men may not be able to make the International officers in Indianapolis see, that to force a strike now on these unreasonable demands would be an act of folly—and a strike may be called on June 1st.

The facts of the case are presented here, for the information of the sections of the public—subscriber and advertiser—reached by this publication.

The attitude of the employing printers is shown by their voluntary action in giving a 10 per cent. increase last year while the agreement calling for the minimum wage of \$32.00 a week had still a year to run.

They feel strongly now, however, that this is not a time when an increase of 36 per cent. in the labor cost of production should be permitted.

If publishers are forced to pay \$44.00 a week instead of \$35.20 and get only 44 hours of work instead of 48, it is inevitable that subscription and advertising rates must advance. No business can stand an increase in its wage bill of 36 per cent. and absorb that increase. The extra cost will have to be added to the sale price of the product.

Publishers sincerely hope that the great body of sane opinion among the local printers may prevail and that the Indianapolis officials will be induced to withdraw their unreasonable demands so that Toronto printers may continue to find well-paid, congenial employment.

If this sane, thoughtful opinion does not prevail, a strike seems inevitable, with its equally inevitable result of loss to the printers and publishers, and inconvenience and loss to the public.

An expression of the opinion of readers of this paper on the Union's proposals, involving an increase of 36% in the labor cost of printed matter, is asked. Will you not write a letter to the editor (not for publication) telling him your view of the situation?

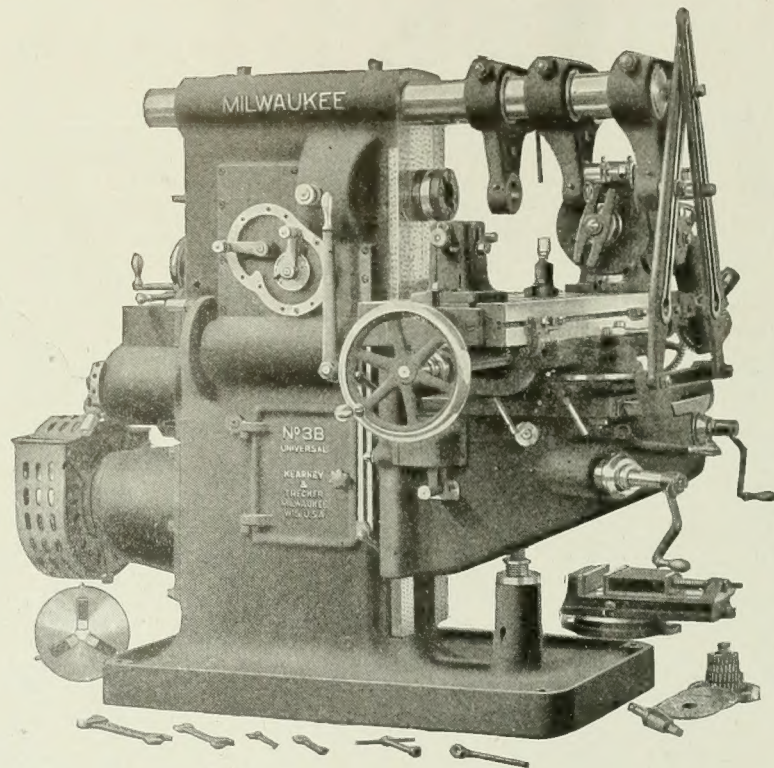
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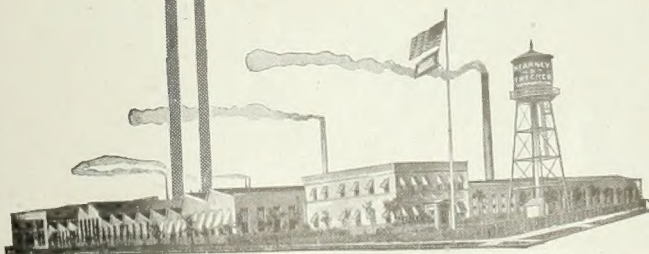
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